ILLUMINATING ENGINEERING

DECEMBER 1953

Photographing Fluorescent Installations in Color
High Speed Photography in Lamp Industry
Temperature Effect on F-Lamp Output
Maintenance of Industrial Lighting
Prefabricated Coffer Ceilings
General Secretary Reports
Committee Personnel

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

Wakefield modular ceiling provides the ultimate in broad area lighting combined with noise reduction

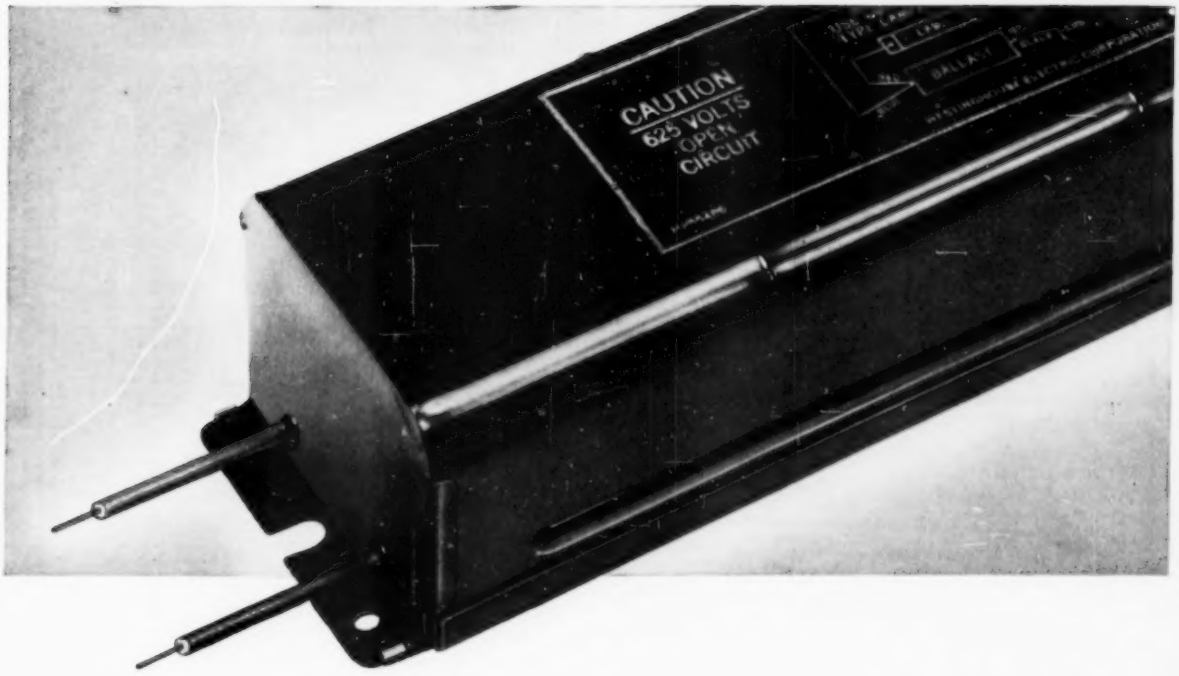
The photograph shows the result, which is admirable. Evenly distributed, low brightness illumination . . . virtually complete lack of shadows and contrasts . . . acoustical baffles reducing noise. In short, a near perfect environment.

So much is obvious to the visitor, the executive and the office worker in this lobby, in the corridors and in ten private offices of Thew Shovel Company, Lorain, Ohio. Less obvious, except to the illuminating engineer, the architect and the contractor, is that Theta-Plex is a complete unified system designed on a four-foot module. The Rigid-Arch Plexiglas diffusers, the acoustical baffles, the channel system complete with ballasts, lamp sockets and internal wiring are an integrated whole built by Wakefield specifically for the area designated.

Note that Theta-Plex does not go wall-to-wall but accommodates supplementary ceiling borders of acoustical tile and is thus adaptable to rooms of any size or shape. Bear in mind also that at each four-foot interval an acoustical baffle may be used, as in this installation, but that if desired the four-foot diffusing panels may be joined together in varied combinations. Moreover, sprinkler heads or high velocity venturas may be mounted, as desired, at the baffle intersections. In other words, Theta-Plex is flexible and adaptable in the highest degree.

For an eight-page illustrated booklet on Theta-Plex, write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Ltd., London, Ont.

Wakefield Over-ALL Lighting



Get all the lamp life you pay for with the new Westinghouse *lead-lag* ballast

. . . the only ballast of its kind

You can be sure of *maximum* lamp life if your ballast is *lead-lag*. Tests prove up to 10% longer lamp life than with any other type ballast. Now—Westinghouse offers this important economy and other lead-lag advantages at lower prices and smaller sizes than ever before. So why not insist on *lead-lag* and provide all the light you're entitled to?

Consider, and prove for yourself, these savings in time and money:

1. Independent lamp operation. Accurate check on lamp burnouts—and no premature replacements. Lose light output only from lamp actually burned out.
2. No more dangerous "stop-go" illusion. *Lead-lag's* stroboscopic correction helps prevent machine accidents; permits use in any industrial and commercial application.
3. Simple wiring, light weight, and small sizes in the new Westinghouse *lead-lag* ballast hold down installation costs.
4. Minimum heat to be dissipated by the fixture, because of the reduced wattage loss in the *new* Westinghouse *lead-lag* ballast.

It's economical and practical to insist on Westinghouse *lead-lag* in any fixture regardless of type, size or style . . . or to replace old, less efficient ballast. Westinghouse *lead-lag* ballasts are available for slimline and pre-heat fluorescent lamps. Phone your nearest Westinghouse office for information and demonstration, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-04347

YOU CAN BE SURE... IF IT'S

Westinghouse

FUSTEST with the LITTLEST!

Two years ago **Starring** led the Industry
with a small, certified Brick Ballast —

240BRS

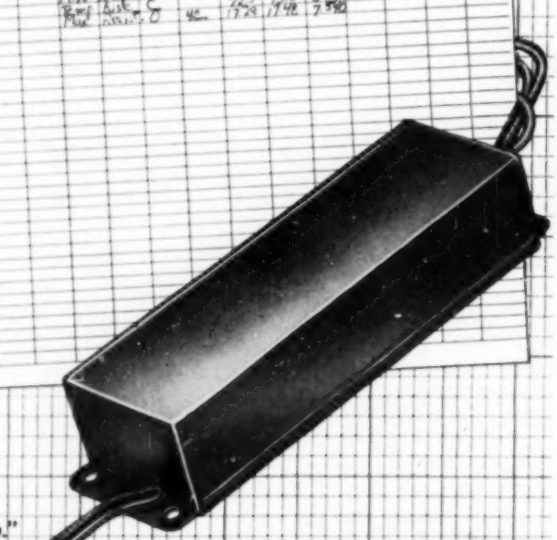
We are flattered that others
now think it worthy of imitation.

CBM CERTIFIED by ETL

ELECTRICAL TESTING LABORATORIES, INC.

TESTS OF FLUORESCENT LAMP BALLASTS

MFR. Starring Co. Inc. PLANT Bridgeport, Conn. DATE SELECTED 8/12/53 BY E. T. Fagan ETL ORDER NO. 22463 M
CAT. NO. 240 BRS FOR 2 LAMPS DATE RECEIVED 8/14/53 MFR'S ORDER NO. 117
RATING: WATTS 40 VOLTS 118 ~ 60 CYCLES DATE TESTED 8/24/53 & 8/25 TESTED BY A.J.C. DATA APPROVED HS



Check them against performance data on any
competitive ballast, and you will know why we say
"Starring Ballasts are Engineered into Leadership."

240BRS
9½" x 2¾" x 2 1/16"
Mounting Length, 8⅞"
Weight 6 pounds

STARRING
& Company, Inc.
1600 Seaview Avenue
Bridgeport 7, Connecticut
4-0108

ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

DECEMBER 1953

Vol. XLVIII

No. 12

Views and Opinions — The Proof of the Pudding — R. C. Allison — 611

Light and Inspiration Enhance Church Interior — Benoit C. Doucet — 613

Lighting a TV Antenna Tower — E. J. Whitlow — 616

Designing the Ceiling around the Luminaire — Don E. Frank — 617

Directors' Room Lighting Designed for Dignity — R. R. Duncan — 618

Some Applications of High Speed Motion Picture Photography to Lamp Manufacturing — I. S. Goodman — 620

Prefabricated Coffer Ceilings — Laurence S. Harrison — 625

I.E.S. Lighting Data Sheet — Series XVIII
High-Bay Industrial Lighting (3-37) — 629

Maintenance of Industrial Lighting — Part II — C. E. Egeler and R. F. VandenBoom — 631

Light and Night Traffic Accidents — Discussion of paper by David M. Baldwin — 635

The Development of Highway Lighting in Metropolitan Chicago and Northern Illinois — Discussion of paper by R. J. Seitz and E. M. Prims — 636

Electrical Characteristics of Lamps and Ballasts — Discussion of paper by W. Calvin Gungle — 638

Photographing Fluorescent Lighting Installations in Color — Willard Allphin — 639

I.E.S. Lighting Data Sheet — Series XVIII
Floodlighting a Harness Race Track (21-17) — 643

Effect of Ambient Temperature on Light Output of Fluorescent Lamps — C. M. Holden — 645

The General Secretary Reports — C. C. Keller — 651

TELECAST — Lighting News of Current Interest — 6A
Here and There with I.E.S. Members, 6A; Lighting Calendar, 9A; Obituaries, 16A; About People 16A; It Seems to Me, 19A; Books and Pamphlets, 19A; New Members, 21A.

I.E.S. Committee Personnel — 1953-1954 — 22A

I.E.S. Publications — 4A, 20A, 31A

Index to Advertisers — 32A

I.E.S. National and Local Officers — for latest listing refer to October 1953 issue of ILLUMINATING ENGINEERING.

Sustaining Members — for latest listing refer to September 1953 issue of ILLUMINATING ENGINEERING.

1953-1954 Officers

A. H. Manwaring — President

Duncan M. Jones — Vice-President

R. F. Hartenstein — Vice-President

Marshall N. Waterman — General Secretary

Kirk M. Reid — Treasurer

Staff

Ruby Redford — Editor

Clayton E. Ellis — Advertising Manager

Publications Committee

J. S. Schuchert, Chairman

R. M. Zabel — E. H. Church

J. H. Ronayne — H. G. Clum

G. T. Anderson — A. M. Page

STATEMENTS and opinions in articles and papers in ILLUMINATING ENGINEERING are the expressions of contributors and do not necessarily represent the policies or opinions of the Society. Official Society opinions are expressed only in official committee reports specifically approved by the Council of the Illuminating Engineering Society.

Founded 1906

ILLUMINATING ENGINEERING SOCIETY

A. D. Hinckley, Executive Secretary — C. L. Crouch, Technical Director

PUBLICATION office 32d Street & Elm Avenue, Baltimore 11, Md.

EDITORIAL and advertising offices 1860 Broadway, New York 23, N. Y.

ILLUMINATING ENGINEERING: The Journal of the Illuminating Engineering Society. Copyright 1953 by the Illuminating Engineering Society. Published monthly in the United States of America. Entered as second-class matter at the Post Office, Baltimore, Md. Acceptance for mailing at special postage rates provided for in Section 1103 P.L.&R., Act of October 3, 1917. Authorized July 16, 1918. ¶ Subscription $10 per year plus extra postage to all countries to which second-class postage rates do not apply; single copies $1.50. ¶ Address changes must be received at I.E.S. headquarters by the first of the month to be effective with the issue of the next succeeding month.

NEW...

A COMPLETE GUIDE TO HOME LIGHTING

Especially for:

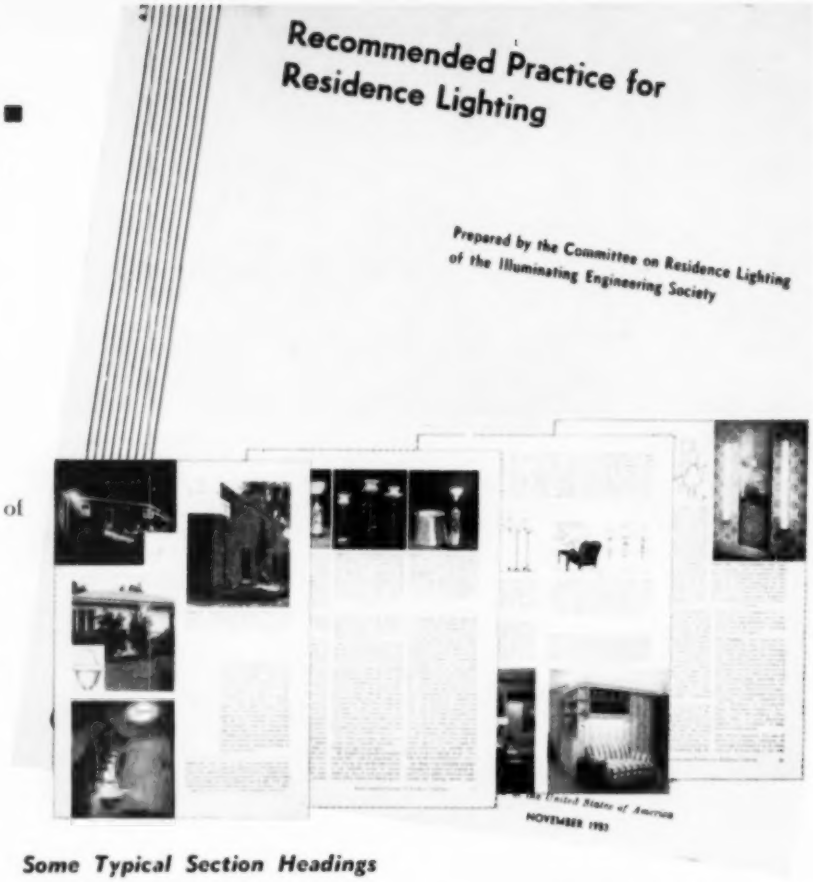
Residence Architects
Interior Decorators and Designers
Portable Lamp Designers
Educators
Home Lighting Specialists in every field

Now in print after several years of intensive discussion and study by leading home lighting authorities, the new I.E.S. RECOMMENDED PRACTICE FOR RESIDENCE LIGHTING is a complete revision of previous I.E.S. publications. Incorporated in the 44-page booklet are all of the latest developments in this vital subject.

This new guide to home lighting includes directions for obtaining good as well as attractive lighting for today's round-the-clock home living . . . shows best type of lighting for close work, such as selection and placement of portable lamps for sewing, reading, desk work, piano playing, kitchen and laundry activities. Photographs and text suggest types of lighting fixtures for living rooms, dining rooms, bedrooms, kitchens and bathrooms, and special lighting for playrooms, closets, porches and outdoor areas. Easily followed line drawings give help on the construction of wall valances and coves for special window effects. Because wall, ceiling and floor reflectances affect good lighting results, a special color chip chart is included, showing a suggested range of 30 colors for these surfaces.

Illustrated, fully-cross indexed, 44-page booklet, complete with color chart and appendices; single copy, $1. Quantity prices on request.

Price $1


Recommended Practice for Residence Lighting
Prepared by the Committee on Residence Lighting of the Illuminating Engineering Society
NOVEMBER 1953

Some Typical Section Headings

Family living patterns
Interior Finishes and Reflectances
Effect of light on color
Use of colored light
Safety
Special decorative effects
Recessed downlights
Lighting for special visual tasks
Hobbies
Exterior lighting
Lighting for task surroundings
Lighting maintenance
Choice of Incandescent-Filament or Fluorescent lamps

TABLES:

I. Illumination Values for Residences (A) Specific Visual Tasks (B) General Lighting
II. Appearance and Reflectance of Selected Surface Colors
III. Dimensions of well-designed Portable Luminaires
IV. Room Description in Total Area
V. Approximate Lamp Footage per room for linear wall lighting elements

PUBLICATIONS OFFICE
ILLUMINATING ENGINEERING SOCIETY
1860 BROADWAY
NEW YORK 23, NEW YORK

Send me ____ copy (ies) new "I.E.S. Recommended Practice for Residence Lighting" at $1 Per copy (1 to 10). Check (M.O.) enclosed ( )

Name _____

Street _____

City _____ Zone ____ State _____

Views and Opinions

The Proof of the Pudding

What effect does color of environment have on effectiveness of a lighting installation? This question was posed to a subcommittee of the Color and Illumination Committee "Effect of Color on Vision"; S. K. Guth, Chairman. They studied this question and came up with a report which states under "Those points on which there seems to be agreement" —

> "1. Considering only the task area itself — that is, the task and its immediate background — brightness contrast (or brightness difference) is so much more important for perception (visibility, acuity, etc.) than is chromatic contrast, that the latter can be neglected for most purposes.
>
> "2. With respect to color of illumination, no real practical advantage has been conclusively demonstrated for any particular quality over any other for the same brightness contrast.
>
> "3. For the entire visual environment, excluding psychological factors such as personal preference, the brightness relationships among various areas are the governing factors as far as ability to see is concerned. Color plays a very minor, if any role.

"Obviously the above points do not include specialized tasks such as color discrimination and matching and many others where relatively small changes in the spectral distribution of light may produce rather important effects upon seeing. They do not, in general, include colored light such as blue, red, or green. However, even in the latter cases, brightness is an all important factor. If colored objects must be discriminated, colored light often will greatly enhance brightness and color contrasts (*i.e.*, color separation work in the printing industry).

"If we confine ourselves to a consideration of so-called white light, ranging from the yellowish of tungsten filament lamps to daylight fluorescent, the above three points can be considered as facts and serve as a basis for guiding illuminating engineers."

In any discussion of seeing, which in itself is a psychological sensation, color must be considered not only in the light source but in the reflected image.

Color is to seeing as taste is to eating. The writer cannot comprehend how any division between the purely physical aspects of sight and the physiological response of the human brain in its translation of the stimuli can be made.

Suppose we re-word the subcommittee's report into another phase, say "eating" instead of "seeing"; "taste" then would take the place of "color" and "brightness contrast" would be "nutritive content," or the physical side of eating. This report might be humorously read as follows:

Those points on which there seems to be agreement are:

> 1. Considering the meal itself — that is, the food in front of you and the accompanying dishes — nutritive content is so much more important for body functions than is flavor, that the latter can be neglected for most purposes.
>
> 2. With respect to taste of a food, no real practical advantage has been conclusively

demonstrated for any particular quality over any other of the same nutritive content.

3. For the entire meal, excluding taste such as personal preference, the nutrition relationships among various foods are the governing factors as far as eating is concerned. Flavor plays a very minor, if any, role.

Obviously, the above points do not include specialized meals such as the finer taste difference between lobster or crabmeat, or sauternes and burgundy and many others where even relatively small changes in the flavor may produce rather important effects on taste.

They do not, in general, include taste sensation such as sweet, sour or bitter. However, even in the latter cases, calories are an all important factor. If flavored foods must be discriminated, certain flavors often greatly enhance the food value and taste (*i.e.*, lemon on fish, dressing on salad).

If we confine ourselves to a consideration of so-called nourishing food, ranging from rare beef or blood-building proteins to cold salads, the above three points can be considered as facts and serve as a basis for guiding master chiefs.

* * * * * * *

This is not meant as a criticism of Dr. Guth's report, which in itself is a very excellent piece of constructive research, but rather a criticism of our own methods of thinking. We are inclined to render our verdict only on the measurable components and ignore the aesthetic or unpredictable feelings.

This seems especially true of technical committee procedure where a sharp line is drawn between the art and the science of almost any subject.

As individuals our lives are governed by a force much stronger than measurable science. Do we choose the family car purely on its mechanical merit? What about line, color, style and popularity? We certainly do not purchase clothing on purely functional principles and rare is the individual who eats or drinks only what is "good" for him.

It is the writer's personal opinion that a "Report on Color and Illumination" should read like a well-planned cook book, appetizing and nourishing recipes that will appeal to the popular taste rather than a coldly scientific dietetic sheet, which in our personal lives we will completely ignore, unless through some misfortune we will be forced to comply.

R. C. Allison
T. Eaton Co., Ltd.
Toronto

I.E.S. Emblem

The official emblem of the Illuminating Engineering Society is available to members in 14-karat gold, lapel screw back buttons, in the miniature ½-inch size, at only $3.50 each including taxes. Background of emblem is blue for Members, red for Associate Members. Emblems may be ordered from the General Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Light and Inspiration Enhance Church Interior

LIGHTING knowledge, reverently used, transformed St. Eusebe Roman Catholic Church in Montreal to an interior of great beauty and comfort. To do so with only $1200 worth of equipment required inspiration as well, and a sensitive appreciation of the problem.

Budget was not the only problem, however, restricting as it was. The building is quite large, 175 feet long — the nave alone covering 140 feet, and the chancel 35 feet. The interior is 70 feet wide, but of even greater concern in lighting design, the arched ceiling of the nave extends 74 feet above the floor. Further, the church roof and ceiling construction made recessed ceiling units impossible, and ruled out standard suspended church lanterns. Servicing was, of course, an additional puzzle.

The solution won for its designer, the I.E.S. Canadian Region's first prize for "My Most Interesting Lighting Job."

Benoit C. Doucet
Montreal Section

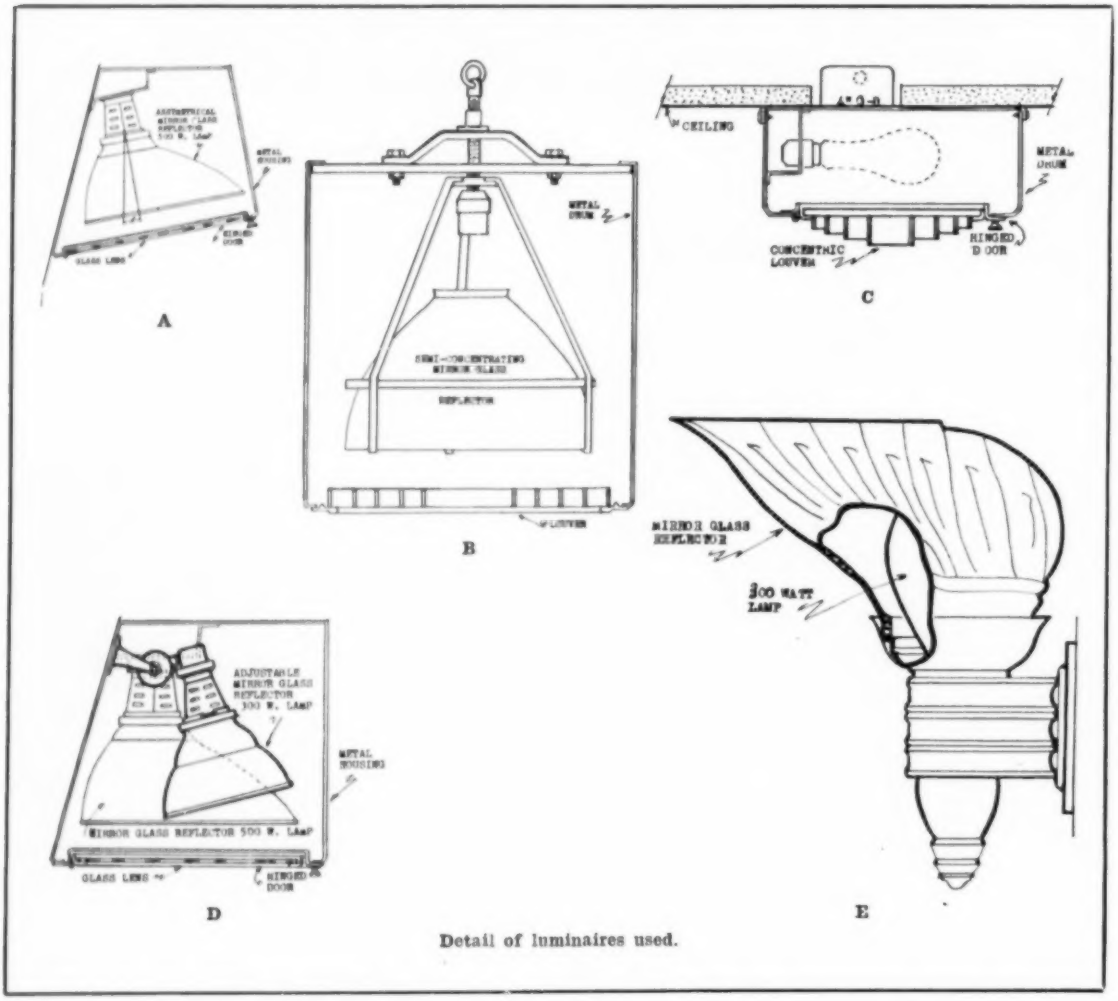
This installation represented the Canadian Region of I.E.S. at the National Technical Conference in the contest for "My Most Interesting Lighting Job," and was awarded first prize in the contest conducted by the Montreal Section. Mr. Doucet is associated with Curtis Lighting of Canada, Ltd., Montreal, Quebec.

The whole installation was developed around concealed lighting of exceptional comfort. All luminaires were designed and located to be out of sight from any normal position, either entering the church or sitting in the pews. The majority are within easy reach of an ordinary ladder and all others may be lowered for maintenance. These hidden sources create an atmosphere of quiet, rest and peace so desirable in a church. The illumination of the ceiling tends to raise the roof toward heaven, an effect always sought by architects in their design of Roman style churches.

Nave

In the nave, where the ceiling arches to 74 feet, luminaires are mounted 26 feet from the floor, behind the beams at the base of each arch, immediately at the top of the column. These units consist of a square housing containing a mirrored glass reflector with asymmetrical light distribution, over a pebbled heat-resistant glass lens set into a hinged door. A 500-watt inside frosted lamp is used in each. (See line drawing "A.") The asymmetrical light distribution of the unit is offset at a predetermined angle measured on the spot to direct the light downward and forward in the direction of the chancel and toward the center of the nave. This provides an even illumination over the pews from the crossbeam of light originating from each opposite side of the church.

The general lighting units in the nave are spaced 24 feet apart in the first four bays. However, in the front bay the distance to the next possible location was 48 feet away. Should the general lighting pattern have been followed here, the unit would have had to be so positioned that it would have directed its light inward toward the center, thus creating annoying glare. This was overcome by the installation of another specially designed unit mounted into a ceiling ornament located in the center of the



Detail of luminaires used.

front bay. The design of this unit involves a cylindrical drum containing a 1500-watt semi-concentrating type mirrored glass reflector over a louver. (See line drawing "B.") This unit is mounted in such a manner that it can be lowered down to the floor for servicing. An additional feature is its control by a dimmer to obtain various levels of illumination for different church services.

Sides and Balconies

The side and rear balconies are lower than the position of the lighting units in the nave, necessitating a different method for the area under the balconies. Since it was impossible to recess any unit into the ceiling under the balconies, and the use of the conventional opal glass globes would have contrasted undesirably with the concealed-light method used in the rest of the church, a special low-brightness design was developed for this area. The unit used, mounted directly on the ceiling, is a shallow drum four inches deep by ten inches in diameter using a hinged door for relamping and employing a 200-watt inside frosted lamp over a concentrating louver. (See line drawing "C.") The unit is finished the same color as the ceiling and the overall low brightness of its appearance harmonizes with the invisible sources used elsewhere. Units similar to those in the nave are used for lighting over the balconies. They are mounted on the side walls of each balcony and are located in such a way that they are not visible from normal position in the nave.

Chancel

The chancel is, of course, the attraction point in this type of church. Here, general lighting is accomplished by units similar to those in the nave, located in the same manner around the periphery of the semi-circular shape of the wall. To highlight this area with much higher levels in contrast with the nave, an additional 1500-watt unit is mounted into a decorative ceiling ornament located immediately in the center of the chancel, providing a "punch light" over the whole chancel. In its design, the unit is similar to the one used in the main ceiling over the front bay of the nave, and is also serviced by lowering to the floor.

To direct attention to the altar proper, a 500-watt concentrating mirrored glass reflector was concealed in the canopy ceiling which covers the altar. Still further highlighting is provided by a 300-watt concentrating type and 200-watt semi-concentrating mirrored glass spotlights, concealed on each side wall, focused on the altar.

Two small side altars located on each front wall of the nave had to be provided with individual localized illumination. This presented another problem since the only position for the location of such light sources conflicted with the location of a unit required for general lighting in the chancel. A dual function unit was designed and located at the same position as those used for general lighting, similar in shape but with a larger housing in order to accommodate two asymmetric mirrored glass reflectors. (See line drawing "D.") One used a 500-watt lamp to provide for the general lighting requirements of the chancel, and the other used 300-watt directing light toward the side altars. The 300-watt reflector is supported on a swivel arm and can also be focused over a large radius around the chancel to provide for temporary localized highlighting at required locations in the chancel.

The surface of the main ceiling is lighted from a decorative wall urn mounted on the face of each column and at a few other locations. (See line drawing "E.") This indirect lighting provides a very even distribution of shadowless illumination over the entire ceiling and brings out the color of the murals.

Illumination Levels

Illumination readings have a ratio of 1-3-7 over the three main areas as follows:

General lighting in nave and over balconies	Ratio 1—10 ft-c
General lighting in chancel	Ratio 3—30 ft-c
Highlighting of main altar	Ratio 7—70 ft-c

These ratios are set to meet the required atmosphere recommended for such a church. In the nave and balconies the illumination at 10 footcandles, ratio 1, is sufficient for the reading of prayer books. The attention of the worshipers should be directed toward the chancel. Here 30 footcandles, ratio 3, provides sufficient brightness in contrast with the nave to attract the eyes. But the "heart" of such a church rests further within the chancel, where the altar is located. Here, 70 footcandles, ratio 7, on the altar proper, centers the eyes of the worshipers to this point.

Lighting a TV Antenna Tower

OVER a radius of nearly 20 miles, the illuminated antenna tower of television KRLD-TV in Dallas, Texas, stands out as a nighttime landmark. The successful floodlighting of this structure is one of the most unusual lighting installations reported in recent years. Rising 586 feet into the Texas sky and topped with an 80-foot TV antenna, the KRLD-TV tower is a lace-like fabrication of steel truss-work, tapering from 50 feet square at the base to six feet square at the top. Although it appeared to be an unlikely subject for floodlighting, the owners hoped to make their tower visible from all parts of the city at night and the project was undertaken.

Familiar illumination design data and calculations were of little help because of the unique nature of the problem, and the final lighting plan was determined by trial and error. It was apparent from the first that projectors of very narrow beam-spread were required, and, after a few experiments, PAR-56 spot lamps were chosen for the job.

There are 36 fixtures in the installation. Four 1000-watt enclosed floodlights are located at the base of the tower, with 32 PAR lamp units mounted on the tower proper. Twelve of these units are located at the 75-foot level, with four units at each of the 150-foot, 225-foot, 325-foot, 435-foot and 586-foot levels. The lampholders are mounted three feet out from the tower to give the necessary coverage, while the use of a T-condulet on each arm permits it to be swung up alongside the tower for easy relamping. Glass snap-on covers for each unit protect the upturned faces of the lamps from breakage due to rain.

Total power load of this floodlighting installation is 13.6 kilowatts. A plus benefit from the lighting is the improved obstacle marking for the protection of low flying aircraft.

E. J. Whitlow, Southwestern Section

This installation represented the Southwestern Region of I.E.S. at the National Technical Conference in the contest for "My Most Interesting Lighting Job," having won first prize in the contest conducted by the Southwestern Section. Mr. Whitlow is with McClure Electric Company, electrical contractors in Dallas, Texas.

Designing the Ceiling Around the Luminaire

EXPERIENCES encountered in the remodeling of this large bank lobby brought its designer to the conclusion that for many installations the ceiling could well be designed around the luminaire rather than the other way around.

The remodeled room is now 55 feet by 135 feet with a 21-foot ceiling. Originally the lobby was half this size, and was illuminated to approximately 10 footcandles from ornate incandescent luminaires. The remodeling plans first submitted called for conventional recessed troffers producing approximately 22 footcandles. Such a layout, however, presented for this area three major problems:

1. Inadequate overall illumination made it necessary to use secondary light sources for teller cages and other critical work areas.
2. The problem of maintenance of the recessed troffers in a 21-foot ceiling might be difficult and costly.
3. The beams and molded coves provided inadequate acoustical treatment.

The owners, architect and electrical engineer, all of whom worked closely with the lighting design engineer, agreed that 50 footcandles of high quality illumination was the desired minimum and that the use of secondary light sources at the working level was to be eliminated.

To achieve this requirement, the revised plan used 24 luminaires laid out on the ceiling area in an even pattern. Each of the 24 luminaires was eight feet square, using low brightness control lens with eight T-12 96-inch cool white lamps. These lenses were held in place by a satin aluminum frame. Each luminaire was suspended with seven three-eighths-inch rods a distance of five feet from the original ceiling, providing a cavity with catwalks for servicing.

The luminaire then served as the support for the

Don E. Frank
Inland Empire Chapter

This installation represented the Pacific Northwest Region of I.E.S. at the National Technical Conference in the contest for "My Most Interesting Lighting Job," having been awarded first prize in the contest conducted by the Inland Empire Chapter. Mr. Frank is Design Engineer for the Columbia Electric and Manufacturing Company, Spokane, Washington.

drop ceiling. This floating ceiling was suspended so that it was flush with the bottom of the luminaires and so that there was a space 3½ feet between the walls and the ceiling, forming a cove. There was sufficient acoustical material provided between the luminaires to reduce the noise level to a minimum. The cove which resulted from placing the ceiling 3½ feet out from each of the four walls, was illuminated with a continuous luminaire installed in the inside corner of the cove away from the wall at approximately a 45-degree angle. This cove luminaire used two T12 96-inch lamps at 430 ma, with the lamps staggered to eliminate any dark areas. The cove lighting provided very effective illumination on the murals and draperies of the wall areas.

The layout was planned for a maintained level of 50 footcandles. After three and a half months' service, average footcandle level at a 30-inch plane, obtained by the average illumination method given on pages 5 and 7, Section 4 of the *I.E.S. Lighting Handbook*, was 51.2 footcandles.

The side walls are an apple green with a reflection factor of 31 per cent; end walls are a plum red with a reflection factor of 19 percent; the terrazzo floor had a reflection factor of 16 per cent, and the walnut furniture and bank fixtures had a reflection factor of 4.5 per cent. These colors tend to bring down the average footcandle level. Readings taken under the center of a fixture and between fixtures were 57 and 58 footcandles respectively, giving a uniform light level. Illumination levels at the tellers work areas, 42 inches from the floor, varied from 56 to 57 ft-c.

A warm, inviting, friendly atmosphere had resulted from the combined techniques of high level general illumination and bathing the walls with light from the cove luminaires.

Directors' Room Lighting —

Designed for Dignity

SINCE bank directors are conservative by reputation, it is not surprising that the relighting of the directors' room of the Harvard Trust Company, Harvard Square, Cambridge, Massachusetts, carried a stipulation prohibiting any alteration of the existing ceiling, walls, furnishings, and floor. The lighting system installed not only met these rather restrictive qualifications, but it also satisfied the two specified visual requirements: (1) the creation of a comfortable, pleasant atmosphere, and (2) the provision of sufficient illumination on the conference table for the easy and accurate examination of detailed statistical reports.

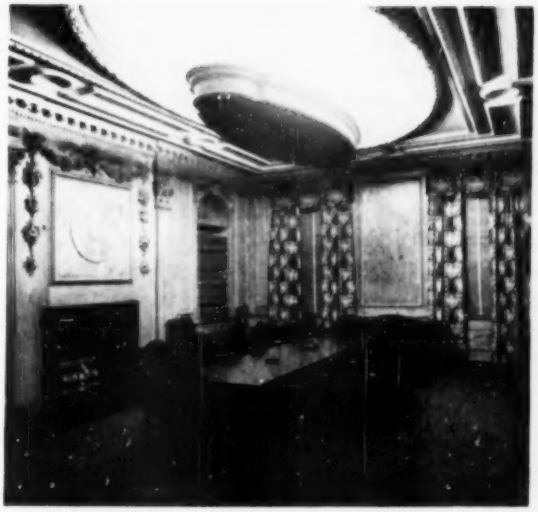
Panelled in custom-carved Flemish oak (reflection factor, 19 per cent), the directors' room is 21 feet wide and 29 feet long. The ceiling is frescoed thumbwork, slightly off-white. In keeping with the interior design of the room, a special fixture was constructed to replace the single chandelier suspended from the center of the ceiling.

Before relighting.

After relighting — using indirect lighting and downlights.

This new fixture houses four F96T12 Deluxe warm white fluorescent lamps for upward light and three recessed annular lighting units, using 200-watt incandescent filament lamps, for downward light on the table surface. A honeycomb louver of fine mesh covering the opening on each recessed fixture blocks all high brightnesses from the normal field of view. The fluorescent lamps are mounted on eight-inch centers.

Approximately 4 x 11 feet in size, this special luminaire supplies 5 footcandles of indirect lighting for room atmosphere and 50 footcandles of direct light on the conference table for critical seeing tasks. Three circuits control the lighting elements in the fixture, one controlling the fluorescent lands, the second controlling the two end filament units, and the third controlling the center filament unit.



After relighting — using indirect component only.

R. R. Duncan, New England Section

This installation represented the Northeastern Region of I.E.S. at the National Technical Conference in the contest for "My Most Interesting Lighting Job," having won first prize in the contest conducted by the New England Section. Mr. Duncan is a Lighting Engineer with the New Bedford Gas and Edison Light Company, New Bedford, Massachusetts.

Some Applications of High Speed Motion Picture Photography to Lamp Manufacturing

By I. S. GOODMAN

Recent deveolpments in high speed motion picture photography have permitted taking pictures at 1000 to 10,000 frames per second. This technique has been applied to several problems in the design and manufacture of lamps where it is particularly useful. Some investigations to be described and illustrated, include initiation of arc on long arc mercury vapor lamps, anode-cathode characteristics on short arc mercury vapor lamps, firing of photoflash lamps, filament vibration in incandescent lamps, and similar phenomena.

Background of High Speed Photography

The present development of high speed photography dates back to 1872 and the historic work of Muybridge. It will be recalled that Governor Stanford of California expressed skepticism to the theory then proposed that at certain stages of a galloping horse's movements, three and possibly all four feet were off the ground. Muybridge set up several adjacent cameras so triggered that a passing horse would trip the shutters successively, providing a series of instantaneous exposures. This system was successful and substantiated the theory concerning the leg positions. About the same time Marey, in France, made similar multiple exposures, with the addition that he invented a stroboscopic desk which permitted the motion to be reconstituted.

During the next fifty years, high speed photography was gradually but slowly improved, more by rapid increases in lens and film speeds than by mechanical techniques, although the spark method was developed and extensively applied to ballistics studies. At this stage, the pictures made were regarded more as stunts than scientific tools. However, with the development of the gaseous discharge tube and the wide publicity given the work of Edgerton and others using such tubes, the great applicability of the high speed technique to many industrial problems became evident.

Thus far, our discussion has been of still photographs. The recent expansion of high speed techniques to motion picture photography in so many industrial fields dates back some 15 years only. In the intermittent shutter motion picture cameras with which we are most familiar through the motion picture theater, the film stops, a shutter opens, the film exposed, the shutter closed, and the film moved to the next frame. With amateur 8 or 16 mm cameras normal speed is 16 frames/sec.; with commercial 35 mm cameras, normal speed is 24 frames/sec. When this intermittent shutter action is increased to speeds much above 150 frames/sec., mechanical failure results in the camera mechanism. To overcome this inadequacy, the rotating prism (or mirror) motion picture camera was developed. The refinement of this camera, which has resulted in so many now being successfully used by industry and the military, goes back only to the technological necessities of the last war. The two current commercially available cameras of this type are the Wollensak Fastax (originally developed by Western Electric) and the Eastman Kodak High Speed Motion Picture Camera. Cameras are available in 8 mm, 16 mm, or 35 mm models; at speeds up to 14,000 frames/sec. Each of the models has its advantages and adherents, and this writer shall not attempt to prejudge them. Cameras utilizing stroboscopic lights continue to have some uses but are more cumbersome than the above and, for our purpose, could not be used because many of the applications to be described were of self-luminous objects.

For the subjects to be presented in this paper, a Wollensak Fastax 16 mm camera was used because it was readily adaptable to our problems and be-

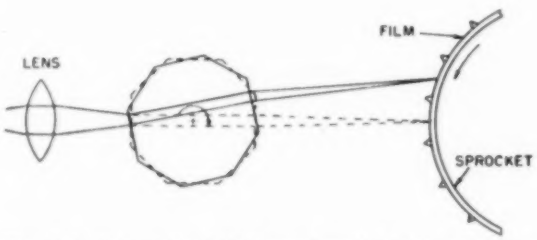


Figure 1. Schematic of high speed motion picture camera.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 14-17, 1953, New York, N. Y. AUTHOR: Lamp Engineering and Design, Westinghouse Electric Corp., Bloomfield, N. J.

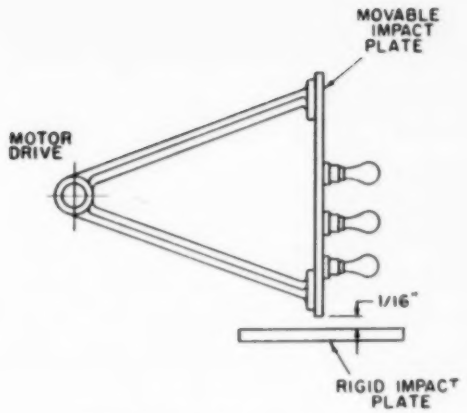


Figure 2. Simplified impact tester.

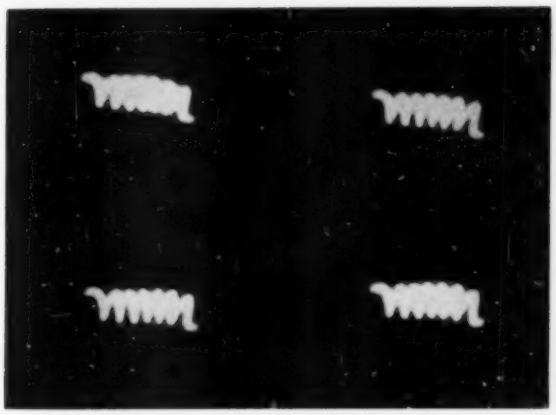


Figure 3. Automobile lamp under impact test (2200 frames/sec.).

cause one such was available in our company at the time. This camera utilizes a continuous moving film with a rotating prism between the lens and sprocket. The prism is rotated in synchronism with the film creating successive and properly spaced images traveling with the film. Fig. 1 is a schematic of the system. The image gathered by the lens is refracted by the prism upward to meet the incoming frame, and as the frame advances downward, the image follows, thereby permitting continued exposure throughout the period that the film passes the aperture. Naturally, at these speeds considerable light is necessary, but our subjects were sufficiently luminous or could be sufficiently illuminated to permit reasonable lens apertures. Unfortunately, as is true of many high speed pictures, the problems to be described can be illustrated best by the projection of the actual films as will be done when this paper is presented; it is hoped that the reader will obtain some value from the frame enlargements accompanying this text.

Vibration and Impact Testing

One application, that will be used to illustrate in some detail the unique use of high speed motion picture photography to lamp design and manufacture, is concerned with impact and vibration testing. Many lamps, especially household types, are burned in fixed positions; other lamps, particularly those on moving vehicles and naval ships and aircraft, are subject to considerable shock and vibration. This is very hard on the incandescent filament which is in suspension between relatively rigid support members.

We should like to know more about the movements of this filament, as to its whole and as to its individuals turns, under impact and vibration. These movements are of too small an amplitude and too frequent to be measured by an observer. One such impact tester is illustrated in Fig. 2. It consists of a vertical plate on whose surface is rigidly mounted a number of suitable sockets having electrical connections for burning lamps in a horizontal position. This vertical plate may be impacted, cantilever fashion, against a rigidly mounted horizontal plate; some control of frequency and amplitude of impact is possible. This type of tester is extensively used for automobile headlights.

Fig. 3 shows four enlargements of 16 mm frames from a motion picture of an automobile lamp being impact tested. The pictures were taken at 2200 frames/sec.; the frequency of impact was 16 cycles/sec.: thus, one cycle of impact was spread over 140 frames. The four frames shown were taken from different positions of one such cycle. One filament is burning at rated voltage; the other is cold as would be normal with such lamps.

A close inspection of these photographs will show varying positions of the turns with respect to each other during the course of one cycling. The whole coil also moves, of course, as can be seen with respect to the fixed line on the frame. By projecting each frame of the 140 total onto a screen, precise measurements can be made which lead to the reconstructed visualizations in Figs. 4 and 5.

Fig. 4 shows the displacement of a fixed reference line during one cycle, this reference line being arbitrarily drawn to coincide with one of the rigidly clamped filament legs. It can be seen that the displacement of the entire coil during one cycle is approximately 0.050" and that the plates bounce slightly on impact.

Fig. 5 shows the vertical displacement of each of

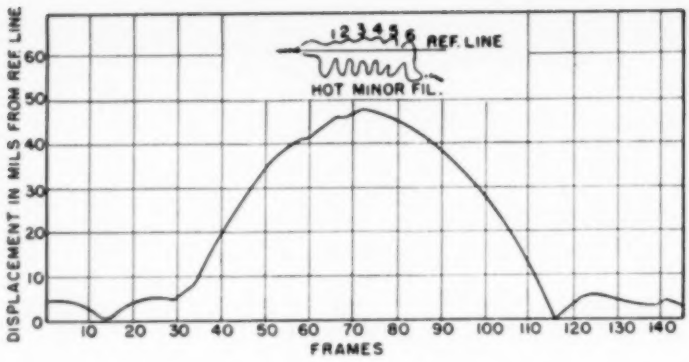

1 2 3 4 5 6 REF. LINE
HOT MINOR FIL.
DISPLACEMENT IN MILS FROM REF. LINE
0 10 20 30 40 50 60
10 20 30 40 50 60 70 80 90 100 110 120 130 140
FRAMES

Figure 4. Coil displacement during impact test (see Fig. 3).

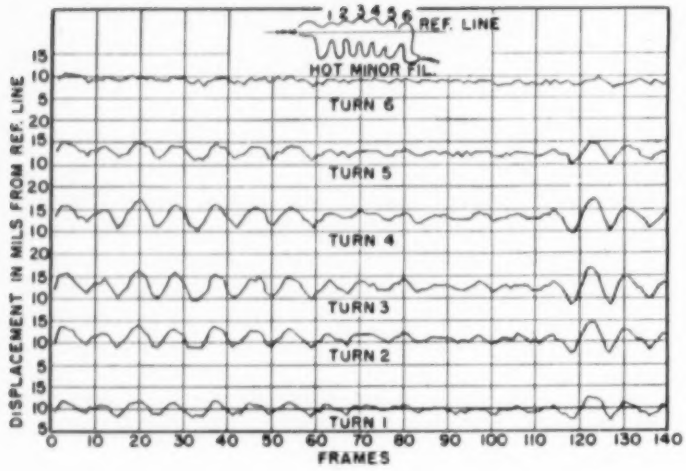

1 2 3 4 5 6 REF. LINE
HOT MINOR FIL.
TURN 6
TURN 5
TURN 4
TURN 3
TURN 2
TURN 1
DISPLACEMENT IN MILS FROM REF. LINE
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
FRAMES

Figure 5. Individual turn displacements during impact test (see Fig. 3).

the individual turns with respect to the same reference line during one cycle. Since Figs. 4 and 5 have the same horizontal time axis, they may be superimposed for easier analysis. One can observe that, during one impact cycle, the individual turns vibrate with constantly varying amplitudes and constantly varying frequencies of 15 to 50 cycles. The center turns vibrate with greater amplitude and lower frequency than do the outside turns.

A similar graph can be made of the horizontal displacements of the turns with respect to one another. Other sets of graphs obtained by this same method can be made using different test conditions, different lamps, different test equipment and all these contribute data which permits us to predict. Accurate production as to filament design and mount construction insures a quality product.

Mercury Lamp Quality

In Fig. 6 we see the action of one of the electrodes in a 400-watt E-H1 high pressure mercury lamp upon starting. In such lamps, occasional poor maintenance has resulted through darkening of the lamp ends in starting. An analysis of the bulb deposit indicated thorium and tungsten which were apparently sputtered off the electrode. Visual observation could not determine the difficulty; however, motion pictures at 720 frames/sec. gave the indications in Fig. 6. These frames are successively 1/6th of ½ cycle apart and show that the arc from the opposite electrode, instead of coming to the tip of the electrode illustrated, went to a lower section

Figure 6. Electrode starting, E-H1 mercury lamp.

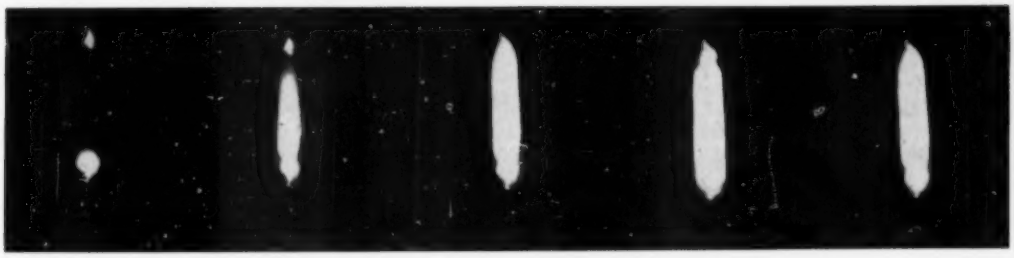


Figure 7. Half-cycle operation, E-H1 mercury lamp.

of the electrode. This section, rich in thorium, would sputter during the short interval of warming the electrode. Design changes permitted an improvement to limit the sputter deposit to a region of the arc tube where a minimum of light would be absorbed.

Fig. 7 shows the operation of such a lamp, shortly after starting, over a ½-cycle period; the picture area now encompasses both electrodes. The speed is 500 frames/sec. only. Some problems having to do with poor fill gas or contaminants, can better be examined with such films.

Fig. 8 shows the operation of a short-arc, 1000-watt, mercury lamp over a ½-cycle period. We hope to improve electrode pitting, arc blow, and general lamp maintenance through the study of these enlargements.

Photoflash Lamp Analysis

It will be appreciated that the investigation of the operation of photoflash lamps is made exceedingly difficult by the short duration of flash. About the only information we are able to obtain is from the oscilloscopic trace of photocell response, which permits the determination of standard light curves as in Fig. 9. However, through the use of high speed motion picture photography, we can greatly extend the time scale of action, so that the approximately 5 millisecond peak of the SM photoflash

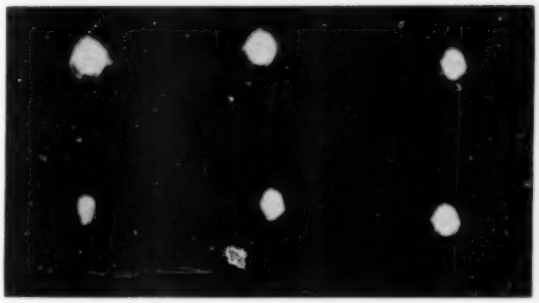


Figure 8. Half-cycle operation, short arc mercury lamp.

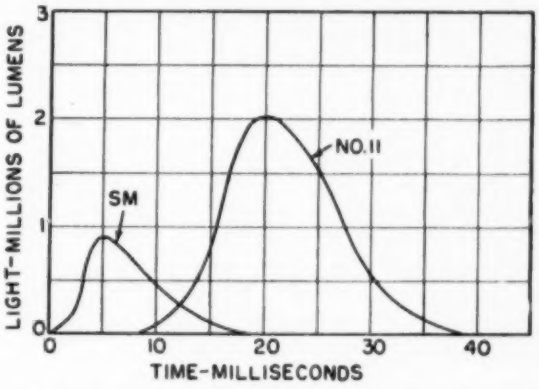


Figure 9. Light curves, SM and #11 photoflash lamps.

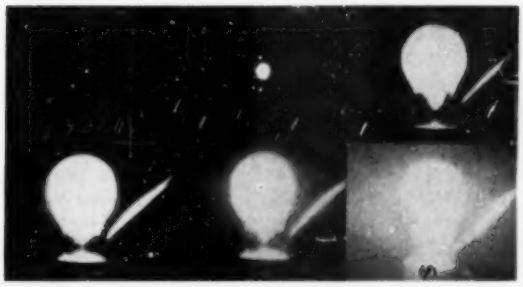


Figure 10. Flashing of #11 photoflash (5000 frames/sec.). Each twentieth frame.

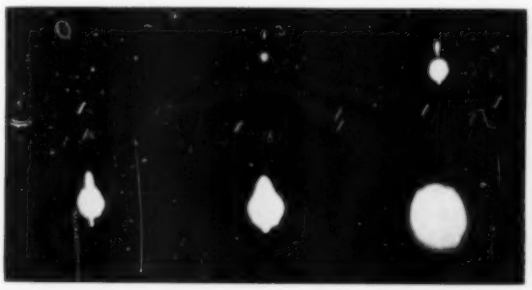


Figure 11. Ignition of SM photoflash (8000 frames/sec.).

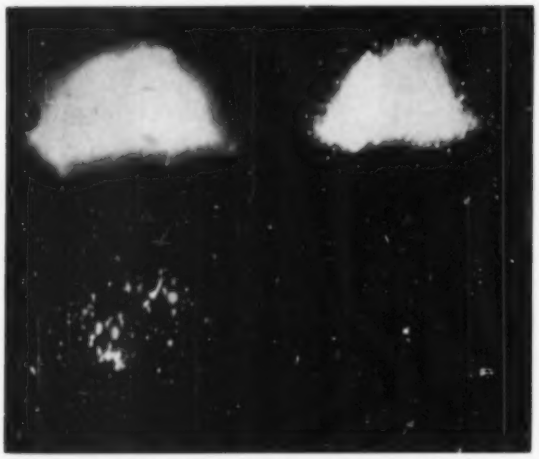


Figure 12. Bulb failure of SM photoflash (8000 frames/sec.).

lamp can be spread over 40 frames at 8000 frames/sec. Fig. 10 shows the first and several successive twentieth frames from a motion picture of the flashing of a #11 lamp at 5000 frames/sec. film speed.

Fig. 11 shows the first six frames in the flashing of an SM lamp taken at 8000 frames/sec. The ignition of the primer by the filament, the propagation of this ignition through the primer, and its effect on the light flux can be easily studied. By examination of the subsequent frames (which are not here shown because the peak of the flash washes out in printing as seen in Fig. 10f) it is possible to accurately verify the light curves and light flux distribution. The ability of various lacquers to prevent bulb explosions and the mechanism of the explosion, when it does occur, can also be determined. The particular lamp in Fig. 11 was not coated with any lacquer which lack caused an explosion. After the flash peak had passed, the glass envelope failed; Fig. 12 illustrates the 108th, 115th, 134th, and 154th frames in the sequence started in Fig. 11a.

Conclusion

A brief history of high speed motion picture photography has been presented. The ability to apply this technique to several different lamp manufacturing and design problems has been demonstrated. It is particularly useful since many of the phenomena in our industry are of 60-cycle or greater frequency. We feel that the proper use of this equipment will provide a potent tool for product improvement.

Acknowledgment is made of valuable assistance in the preparation of this paper by various engineers of the Lamp Division of the Westinghouse Electric Corporation and particularly to Mr. Jack Martin for Figs. 4 and 5.

References

1. "High Speed Photography, Volume I," *Journal of the Society of Motion Picture Engineers*, March 1949.
2. "High Speed Photography, Volume II," *Journal of the Society of Motion Picture Engineers*, November 1949.
3. *High Speed Photography*, John Wiley & Sons, 1952.

DISCUSSION

R. N. THAYER*: Our similar experience in the use of high-speed motion-picture photography confirms Mr. Goodman's report of its value in analyzing short-duration lamp phenomena. An added example of ours may be of interest. In the development of instant-starting 40-watt fluorescent lamps, high-speed motion pictures taken at the cathode gave results somewhat like those Mr. Goodman describes for the mercury lamp. The discharge "danced around" for several cycles, striking at all exposed metal parts of the mount, until the cathode hot-spot was established. Designing the instant-start cathode with an over-wind of fine wire minimized the duration of this sputtering period, and so has reduced end-discoloration and increased lamp life.

In our experience, high-speed pictures are most valuable in the initial examination and analysis of a performance subject. The pictures themselves sometimes suggest a cure for the trouble being investigated, and so end any further need for analysis. In other cases, no remendy for a trouble is sought, but only a better understanding of the details of some phenomenon, such as Mr. Goodman's example of normal flashing on a photoflash lamp.

A. W. WEEKS**: Mr. Goodman has presented a splendid paper calling our attention to a neglected tool for the analysis of high speed phenomena.

The ultra-rapid camera lends itself to the analysis of luminous objects. It should be useful for the analysis of such motion as the Vibrack and the impact testing equipment used for rough service lamps.

May I inquire if the author has investigated either of these devices, or the operation of rough service lamps on them? I think this investigation would be very interesting.

I. S. GOODMAN†: Mr. Thayer's comments are of interest in indicating that high-speed photography is being used elsewhere in the lamp industry. It would certainly be of interest to see and hear the results of this work when Mr. Thayer and his associates can make this public.

Regarding Mr. Weeks' questions. We have not yet used the equipment for analysis of motion on the Vibrack or rough service lamp impact testing equipmeent. In the former application the amplitude of motion is exceedingly small and we do not think that the analysis will prove worthwhile except in the case of heavy filament lamps. As to the latter application, we do intend shortly to apply photography to testing of rough service lamps and shall communicate any results obtained to the interested parties.

*Lamp Development Laboratory, General Electric Co., Nela Park, Cleveland, Ohio.
**Champion Lamp Works, Lynn, Mass.
†Author.

Prefabricated Coffer Ceilings

By LAURENCE S. HARRISON

THE USE of indirectly lighted, plaster coffers continues to have broad architectural appeal. Designed and applied properly, their virtue lies in high output with low relative brightness. This is due to the presentation of a greatly increased area of reflecting surface from inside the coffer through its opening — resulting in more effective horizontal distribution than the distribution with light transmitted through either flat glass or plastic sheets. The latter, to approach performance and efficiency of such coffers, in a comparable arrangement, are now being installed to excellent effect in the form of inverted domes. When ceiling coffers are installed in close array to resemble skylights, such as are usually laid in ceiling sash, there is an unusually subtle effect of natural sky light. With either daylight or cool white fluorescent lamps mounted within the sash mullions, there is very little indication that artificial light sources are being employed, particularly when deluxe lamps are used for comparable daylight, color rendition.

Many visitors to the Cranbrook School at Bloomfield Hills, Michigan, to the Metropolitan Museum's experimental installation in New York in 1948, and to the Recent Accessions Gallery in the Boston Museum of Fine Arts in 1949, will recall the general acceptance of the latter scheme's great desirability as well as a realization of its almost prohibitive cost without substantial prefabrication.

Architectural lighting of this type is particularly suited to exhibition galleries, or public spaces of monumental heights, such as bank floors, show rooms and entrance halls or lobbies.

With a view toward using coffer ceilings of this type in various locations prospectively to be altered under its long range Reconstruction Program, the Metropolitan Museum authorized the design of an installation of a coffer ceiling in the form of less costly standard assemblies which might later be taken down and reinstalled in various museum spaces.

The first such installation was made for a special exhibition gallery to be used as an adjunct to its new auditorium now under construction. This paper describes such development and a subsequent commercial installation in the street lobby of a new Manhattan office building. Additional installations are both being planned and in process under patent licenses from the Research Corporation of New York, a non-profit organization which administers the commercialization of inventions for educational institutions.

The general problem of design involved two general requirements:

1. Selection of a module which would provide:
   a. As large a light opening as conventional, ceiling sash design would permit for a minimum height of 12 feet, in order to minimize the number of parts per unit area.
   b. As shallow a depth as possible to permit economy of hung ceiling space.
   c. The smallest increase in lateral dimensions as possible over the length of the lamp selected to assure maximum utilization of reflecting surfaces.
   d. A separation between coffers of no more than ⅛ inch in order to divide the output of the lamp between adjacent coffers with maximum efficiency.

2. A high efficiency, reflecting surface having curvatures which would maintain uniform reflectance preventing both highlights within the coffer and its contour from being seen when lighted, and which could be easily incorporated into dies or moulds with conventional profiling methods.

The first requirement has been well satisfied by using a center-to-center module of 45.25 inches in both directions with a depth slightly under 13 inches. This module, of course, is primarily adapted to the 42-inch. T6 slimline lamp for standard operation. For special installation requiring dimming over a wide range of light output, one-inch diameter 42-inch long, cold cathode lamps may be employed for series operation providing a maximum lumen output per lineal foot, of about 375.

The spacing requirement has been solved by making the coffer of .094-inch thick, formed, sheet aluminum or of the same thickness in laminated plastic, the sides of both types of coffers having sufficient outward spring to make them fit closely together.

The second specification obviously requires the provision of as near a spherical contour as the

AUTHOR: Consulting Engineer, Metropolitan Museum of Art, New York, N. Y.

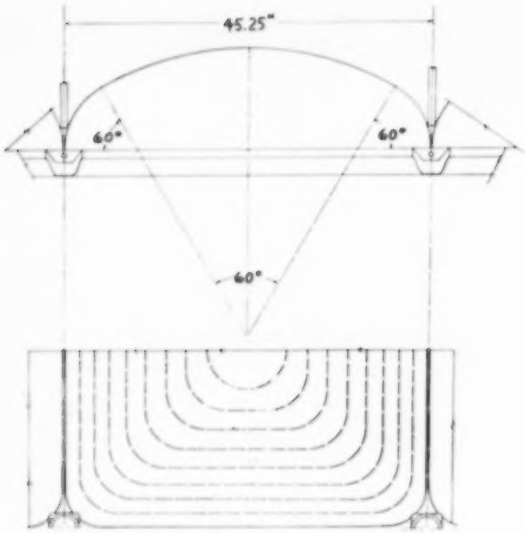


Figure 1. Diagrammatic view of coffer.

square form of the opening will permit. The method of doing this is shown in Fig. 1. The cove of the coffer has a radius of nine inches with an arc of 60 degrees to a common point of tangency with the approximately thirty-six-inch radius of the dome. The dome also has an arc of 60 degrees and the coffer, in section, thus forms a semi-ellipse. The corners have a radius of 4¾ inches and the quadrants are projected upward, in planes parallel to the base, through the diagonal contour of the coffer to the apex of the dome. Here the four corner quadrants meet in a perfect solid, spherical angle which has the radius of the dome and is subtended by a 9½-inch diameter circle.

Thus no point on the surface of the coffer is of other than a cylindrical or spherical locus. The total, reflecting surface of the coffer is about 43 per cent greater than the "sash" opening. Total weight is approximately five pounds per square foot, and the coffer assembly is normally suspended from 2" x 2" x ⅛", steel, structural angles bolted to ceiling slabs at appropriate intervals. To compensate for dimensional irregularities in installation, each suspension member is attached to the angle supports by at least two steel chain links.

All suspension members are made of aluminum and are equipped with outlet boxes, having stirrups for supporting the sash mullions, reflectors, lamps and lamp holders, and the coffers themselves. Each suspension member is accurately registered within its module by aluminum, angle spacers held to plus or minus .005 inches. Coffers are painted with high reflectance (90 per cent or better) matte-white enamel before assembly and are simply lifted into each nest from below and dropped on to the stirrups.

The circuit distribution must be arranged to minimize stroboscopic effects so that each coffer will have three of its lamps on separate phases of a 4-wire, 3-phase system, regardless of whether single or 2-lamp ballasts or remote, cold cathode transformers are used. The position of the lamp in the mullion sash with respect to exposure at sight lines within a distance of 100 feet, for 12-foot ceiling height, has been carefully determined. High reflectance, white baked enamel reflectors are used under each lamp. The accompanying photographs show the ceiling in process of installation and the finished appearance of both the Metropolitan Museum Gallery E4, and the Lobby of 260 Madison Avenue in New York.

Performance is subject to dimming for gallery work and, as stated previously, may comfortably be adjusted to lamp outputs as high as that for standard 300-milliampere operation provided the ceiling height is 16 feet or more. Cool white deluxe lamps are essential and light output at 200 milliamperes may be considered standard.

Efficiency depends in part upon the size and shape of the coffer field, that is to say, upon a modified ratio between the number of perimeter lamps to the number of field lamps. This fact is obvious because the four corner coffers have two lamps which are shielded on one side, and all those around the perimeter have one lamp shielded, all of which work at little more than half output. A long narrow array would therefore be less efficient than a perfectly square one.

The relationships of size and shape to factors of utilization are as follows for any simple, rectangular array of x by y coffers —

(1) $2 \times y + (x + y) =$ total number of lamps

(2) $2 \times y - (x + y) =$ { number of lamps working both sides (field)

(3) $2\,(x + y) =$ { number of lamps working one side (perimeter)

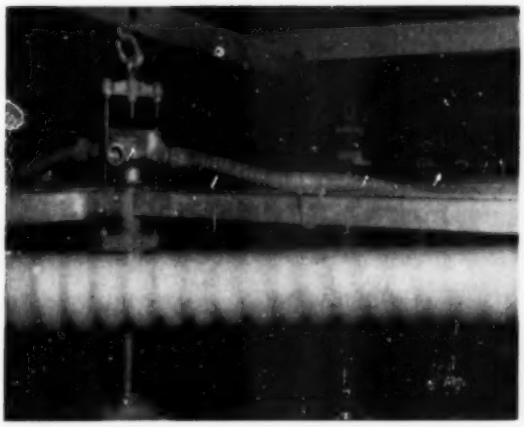
(4) $2\,x\,y =$ number of "effective" lamps

The basic efficiency of the system may, therefore, be expressed as $\frac{(4)}{(1)}$ or $\frac{2\,x\,y}{x + 2\,x\,y + y}$, for the reason that the perimeter lamps (3) are (approximately) 50 per cent effective, so that only half of them are added to the field lamps (2) to obtain the number of "effective" lamps.

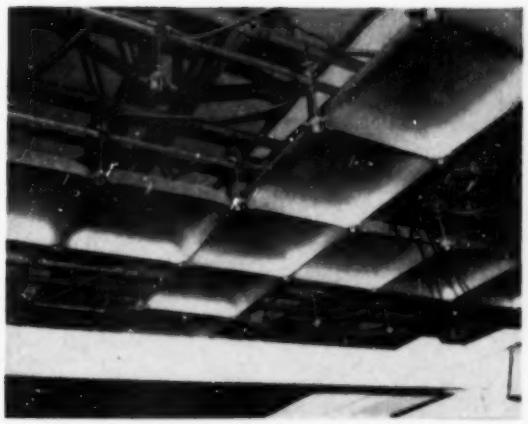
Basic efficiencies therefore run from 91 per cent for a 100 coffer (10 x 10) array to 67 per cent for four coffers (2 x 2), and 50 per cent for a single coffer. These values are before applying conven-

Elevator corridor lobby of 260 Madison Avenue, New York City. Total installation: 70 coffers in T-shaped assembly.

Gallery E-4 of the Metropolitan Museum of Art, New York City. A total of 72 coffers, in 8 x 9 arrangement, with wall concentration from border lighting.



Suspension elements showing action of flexible links.



Partially assembled ceiling showing outlet boxes, coffers resting on stirrups.

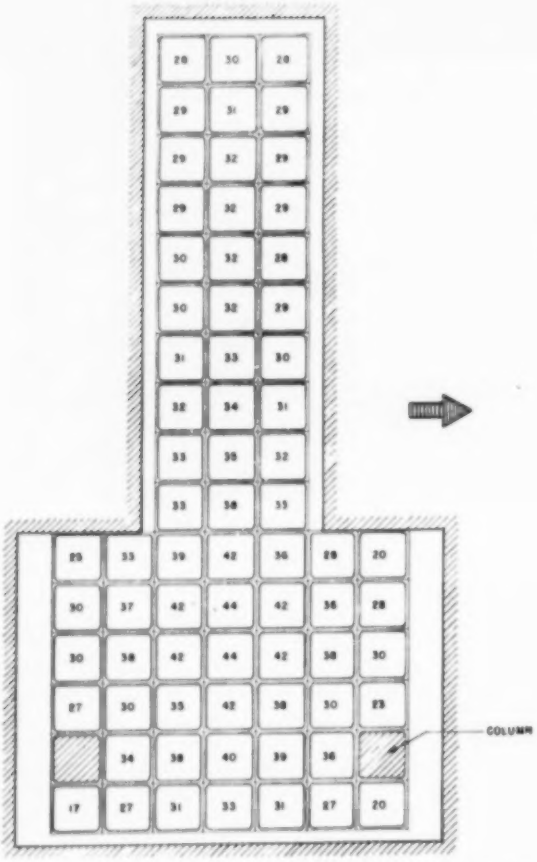


Figure 2. Reflected ceiling plan. Illumination given in horizontal footcandles.

tional utilization factors. A 3 x 3, square panel having nine coffers employs 12 perimeter lamps, working on one side and 12 field lamps working on two sides each. From the standpoint of basic efficiency (about 70 per cent), this would be the smallest practical size to employ and, from an architectural standpoint, it should, in the writer's opinion, be the smallest size able to maintain the illusion of a skylight monitor above. Using the best grade of 90 per cent reflectance matte, white paint in reflectors and coffers, this ceiling should hold its own in performance with other luminous ceilings.

Fig. 2 indicates results at 260 Madison Avenue after approximately 1000 hours of operation with lamps operating at 200 milliamperes, and the following characteristics apply:

COFFER ASSEMBLY

		Per Coffer	Total
(a) Initial Lamp Lumens:			
Inside (field) Coffers	(30)	2175	65250
Sides and at Columns	(32)	2719	87008
Corners and at Columns	(6)	3263	19578
Corners (NE and SE)	(2)	3806	7612
Total Initial Lumens	(70)	——	179448
(b) Measured Coffer Output after 1000 hours: (16.5 sq. ft. of working surface at 60.2 lumens per sq. ft.)		993	69510
(c) Efficiencies after 1000 hours:			
Inside coffers (field)		46%	
Side " (perimeter)		37%	
Corner " "		30%	
Corner " (NE & SE)		26%	
Total Ceiling — 1000 hours			39%

(d) Average Brightness — 60.2 footlamberts

ROOM — (Ceiling Height — 12 ft. — 1267 sq. ft. area)

(a) Measured average footcandles:		
Elevator Corridor	13'-6" x 39'	31.0 ft-c
Entrance Lobby	31'-6" x 23'-6"	33.5 ft-c
Room average		32.5 ft-c
(b) Utilization at 1000 hours: (Room factor G — Walls 22.6%)		22.5%

See List of I.E.S. Committee Personnel, 1953-1954

Pages 22A, 25A, 27A, 28A and 30A, this issue.

INSTALLATION AT BALDWIN, LIMA, HAMILTON CORPORATION, SOUTHWARK DIVISION
EDDYSTONE, PENNA.

High-Bay Industrial Lighting

LIGHTING OBJECTIVE: To provide, economically, sufficient general illumination for machine tool work, with improved highlights from high-mounted units.

GENERAL INFORMATION: The bay shown above is 80 feet wide, 480 feet long and 60 feet high. Colors and reflectances are as follows:

girders	buff	60%
dado (around columns)	tan	25%
floor	gray concrete	20%
machinery	machine gray	40%

The floor area is devoted mainly to machine tool operation (lathes, planers, etc.) and assembly of parts into finished products that may range from large hydro-generators and gigantic hydraulic presses to very small delicate machines.

INSTALLATION: Figure 2 indicates the luminaire spacing. Westinghouse #1565895 luminaires containing 3000-watt A-19 mercury vapor lamps are mounted on centers 24 x 25 feet apart. Intermediate units are Miller Co. PRAS-1000 containing 1000-watt incandescent filament lamps. All are mounted 45 feet above the floor. The resultant illumination averages 110 footcandles.

(over)

A.I.A. File No. 31-f

Brightnesses are as follows:

girders	48 ft-L
dado (around columns)	20 ft-L
floor	20 ft-L
machinery	40 ft-L

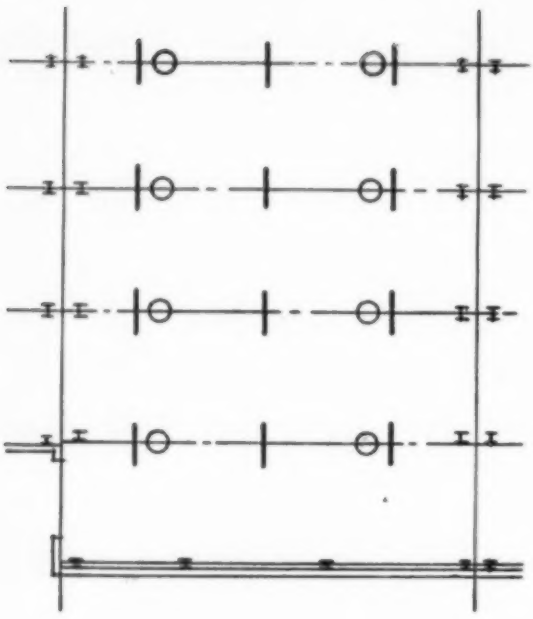


Figure 2. (left) Plan view.

Lighting designed by G. William Wagner, Philadelphia Electric Company; electrical engineer: George Jaynes of Baldwin, Lima, Hamilton Corp.

Lighting data submitted by G. William Wagner, Philadelphia Electric Company as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Maintenance of Industrial Lighting—Part II

By C. E. EGELER
R. F. VANDEN BOOM

THE ILLUMINATION depreciation resulting from dirt on lighting equipment has a marked influence on the economics of industrial lighting from the standpoint of both initial investment and maintenance costs. Yet relatively few data are available regarding the quantitative effect of "luminaire dirt" on light output in various types of industrial areas.

Light Output Depreciation Due to Dirt

One way to establish realistic depreciation rates is by actual field tests. A 1951 Technical Conference paper[1] reported on tests inaugurated by the authors in January 1951, to obtain practical data relating to the illumination depreciation due to dirt. This initial test was extended to cover a period of two years. These data are now presented for the one office and several industrial areas tested at a plant in Erie, Pennsylvania.

The test was started with clean luminaires and new lamps. Throughout the first year, monthly illumination measurements were taken as stated in the authors' previous paper. During the additional 13 months, measurements were taken less frequently since the rate of change of illumination level had decreased considerably. At the end of the test, footcandle readings were recorded, the luminaires were cleaned, the measurements again taken. The data reported previously employed calculated lamp depreciations. However, at the end of the test since illumination measurements were taken before and after cleaning, the effect of lamp depreciation was eliminated. This explains a slight apparent discrepancy in depreciation values between the early month data reported here and those shown in the earlier paper.

The data reported are all on two-lamp fluorescent luminaires of the closed-top, industrial type. Open-end, 40-watt synthetic enamel units of identical design were installed in every area except the core room. These provide a direct comparison of the effect of dirt in the various areas tested. The data cover only luminaires in which no lamp failures occured during the test period.

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 14-17, 1953, New York, N. Y. AUTHORS: Application Engineering Dept., Lamp Division, General Electric Company, Nela Park, Cleveland, Ohio.

Fig. 1 shows the depreciation due only to "luminaire dirt" in low bay areas (8-ft to 12-ft mounting height). The single lamp 40-watt aluminum troffers (identified by 40AT in Fig. 1) depreciated relatively little—less than 7 per cent in 25 months—in the non-air-conditioned office. However, the 40-watt synthetic enamel office units depreciated slightly more in the 12 months they were tested.

The work done in the air-conditioned laboratory involved experiments with refrigerators in a relatively clean atmosphere. Both porcelain and synthetic enamel industrial units (40P and 40S, respectively) were tested in this area. The maintenance of these particular finishes appears to be about equal with a slight advantage indicated for porcelain although the two curves tend to converge during the second year of the test.

The luminaires in the woodworking shop depreciated 27 per cent in 25 months. In the more severe dirt conditions of the core room, where porcelain enamel luminaires for 90-watt lamps were tested, the illumination decreased 38 per cent.

For the high bay areas (20-ft to 50-ft mounting height) depreciation curves are shown in Fig. 2. The refrigerator storage area is an active warehouse with the luminaires mounted about 50 feet high. The data for a 12-month period indicate the relative cleanliness of the area, with less than 12 per cent depreciation in one year.

In the machine shop the heavy machining operations produced an oily, greasy type of dirt on the luminaires in spite of the fact that they were mounted about 40 feet above the floor. At this height, the concentration of dirt did not appear severe, although the test indicated a depreciation of some 28 per cent in 25 months. In the welding shop the fixtures were mounted at 20 feet. A yellowish-brown powder-like substance was deposited on the luminaires resulting in a total depreciation due to dirt of 44 per cent.

In the foundry, porcelain enamel RLM luminaires for both 40-watt and 90-watt lamps were tested, in addition to the 40-watt synthetic enamel units. The depreciations of these different units were similar. However, here again there appeared a slight tendency for the synthetic enamel finish to depreciate more rapidly than the 40-watt porcelain finish during the early months of the test. It is

interesting to note that these two curves began to converge and actually crossed after about 21 months, leaving the synthetic enamel finish in a more favorable position thereafter. The 90-watt porcelain units depreciated more rapidly than the 40-watt porcelain, although the shapes of their depreciation curves are quite similar. However, too much emphasis probably should not be placed on the small differences in these foundry depreciation curves.

Depreciation Due to Dirt on Lamps Alone

At the termination of the test, in most of the areas the lamps alone were first cleaned and measurements taken. Then the reflectors were cleaned and final illumination readings were obtained. These data are summarized in Table I. It will be seen that in all areas except the office and woodworking shop cleaning the lamps alone had a much lesser effect on illumination than did cleaning the reflectors. However, practically all of the dirt on the aluminum troffer luminaires in the office was deposited on the lamps and, hence it would be difficult to justify reflector cleaning on a purely economic basis in this particular instance. Before cleaning the luminaires in the woodworking shop, it was noted that *both* reflectors and lamps were coated with minute particles of sawdust. The greater effect of dirt on the lamps might be explained by the fact that the sawdust, being relatively high in reflectance, produces little effect on the efficiency of the reflector, but by virtue of its low transmittance, the sawdust particles are capable of affecting lamp output materially.

TABLE I.—Lamp Dirt vs Luminaire Dirt.

Area	Lamp Wattage and Reflector Finish	Total Luminaire Depreciation (Dirty Lamps and Reflectors)	Reflector Depreciation (Clean Lamps and Dirty Reflectors)
Office	40 Aluminum Troffer	6%	Negligible
Ref. Storage*	40 Synthetic Enamel	11%	9%
Ref. aboratory	40 Porcelain Enamel	18%	14%
Woodworking	40 Synthetic Enamel	27%	8%
Heavy Mach. Shop	40 Synthetic Enamel	28%	16%
Core Room	90 Porcelain Enamel	38%	23%
Welding Shop	40 Synthetic Enamel	44%	36%
Foundry	40 Synthetic Enamel	56%	49%

*12 month values — all others are 25-month depreciation.

Maintenance Factors

The illuminating engineer may often select the maintenance factor on the basis of luminaire type alone. The maintenance factor should be based also upon the nature of the operations in the area and the proposed frequency of cleaning.

Integrating the depreciation curves of Figs. 1 and 2 to a given month which will represent the interval between cleanings, the per cent mean output of each luminaire can be determined. Neglecting the dirt on wall, ceiling, and floor surfaces, the actual maintenance factor for each area involved can be found by multiplying this mean value by the mean output of the lamp type involved. Maintenance factors obtained in this manner are shown in Table II. Calculated maintenance factors are shown for one, two, three, four and six cleanings per year. However, with no cleaning the maintenance factor depends upon the total years of service of a given lighting installation. Since this would vary widely, we have chosen the value to which the system depreciated after 25 months as approximately representative of the mean output of a system which is never cleaned.

Excluding the office areas, the maintenance factors vary from .83 in both the laboratory and storage area when cleaned six times per year to as low as .32 in the foundry assuming no cleaning. The number of cleanings per year partially deter-

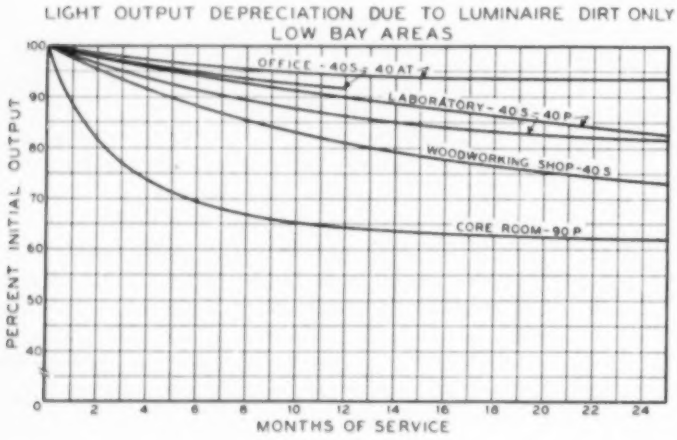


Figure 1. Effect of luminaire dirt in low bay areas.

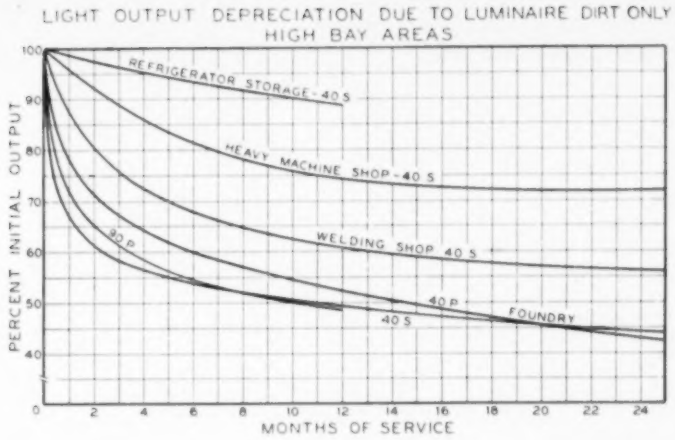


Figure 2. Depreciation in light output in high-bay areas.

mines the maintenance factor to be used. On the other hand, a comparison of the maintenance factors may well determine which proposed cleaning schedule plant management will adopt. For example, assume that a given number of luminaires produces the desired maintained illumination in the welding shop based on two cleanings per year. To obtain the same average footcandles without cleaning, a comparison of the maintenance factors reveals that 40 per cent additional luminaires would have to be installed. Since cleaning costs are normally a small percentage of the annual owning and operating cost of the lighting system, periodic cleaning is usually more economical than the higher initial investment.

Economics of Cleaning

Maintenance plays an important part in the overall cost of lighting. While other factors such as group replacement may materially reduce costs, this discussion will be confined to the economics of cleaning. The objective is to produce maintained footcandles at the lowest possible cost with a given type of equipment. Annual operating costs per luminaire for each of the areas tested are shown in Column 4 of Table III. These include lamp cost at 30 per cent discount, labor and overhead cost of 50c per lamp replacement, and electrical energy cost at 1½c per kilowatt-hour. The operating cost is largely dependent, of course, upon the annual burning hours (Column 3, Table III). Consequently it will be seen later that the economics of cleaning are largely influenced by annual burning hours.

Annual owning costs include luminaire, installation and wiring costs, amortized at 15 per cent per year. The annual owning cost plus operating cost is shown in Column 5. The cleaning costs per luminaire (Column 6) were obtained from an experienced lighting maintenance contractor.

By comparing the overall costs including cleaning with the resulting increase in maintenance factors (Table II), the relative overall cost of light was obtained for the various cleaning schedules. The figures for minimum cost of light shown underlined in Column 7, Table III, indicate that no one

TABLE II.—Maintenance Factors for Test Areas.

Area	Luminaire Type[1] and Finish	Burning Hours Per Year	Maintenance Factors[2] Cleanings Per Year					
			0	1	2	3	4	6
Low Bay (8′ to 12′ Mounting Height)								
Office	1 – 40W Aluminum	2000	.78	.81	.82	.83	.83	.84
Office	2 – 40W Synthetic	2000	.73	.80	.81	.82	.83	.83
Laboratory	" "	6200	.68	.77	.80	.81	.82	.83
Laboratory	2 – 40W Porcelain	6200	.69	.80	.81	.82	.83	.83
Woodworking Shop	2 – 40W Synthetic	3000	.61	.75	.79	.80	.81	.82
Core Room	2 – 90W Porcelain	4600	.50	.58	.64	.67	.69	.72
High Bay (20′ to 50′ Mounting Height)								
Refrigerator Storage	2 – 40W Synthetic	8700	.69	.79	.81	.82	.83	.83
Heavy Machine Shop	" "	2300	.61	.70	.75	.78	.79	.81
Welding Shop	" "	4000	.47	.60	.66	.69	.71	.74
Foundry	" "	3600	.37	.47	.51	.53	.56	.58
Foundry	2 – 40W Porcelain	3600	.36	.53	.58	.62	.64	.67
Foundry	2 – 90W Porcelain	3600	.32	.46	.51	.54	.56	.59

[1]All luminaires of the closed-top industrial type except for single lamp aluminum troffers used in the office area.
[2]Includes inherent lamp depreciation and effect of dirt on luminaire.

1. Area	2. Luminaire Type[1] and Finish	3. Annual Burning Hours	4. Annual Operating Cost/Luminaire (Without Cleaning)[2]	5. Annual Owning & Operating Cost Per Luminaire Without Cleaning[3]	6. Cost Per Luminaire Cleaning	7. Relative Overall Cost of Light — % Cleanings Per Year						8. Economic Cleaning Cost (Maximum) Per Luminaire for 2 Cleanings Per Year
						0[4]	1	2	3	4	6	
Low Bay (8' to 12' Mounting Height)												
Office	1 - 40W Aluminum	2000	$ 1.77	$ 7.27	$ .50	100	104	108	114	120	132	$ .19
Office	2 - 40W Synthetic	2000	3.54	8.17	"	100	97	100	105	110	120	.45
Laboratory	" "	6200	11.00	15.62	"	100	92	91	92	94	99	1.39
Laboratory	2 - 40W Porcelain	6200	11.00	15.79	"	100	90	91	92	94	99	1.36
Woodworking Shop	2 - 40W Synthetic	3000	5.30	9.93	"	100	86	85	88	91	97	1.23
Core Room	2 - 90W Porcelain	4600	18.02	26.19	.80	100	87	83	81	81	82	3.65
High Bay (20' to 50' Mounting Height)												
Refrigerator Storage	2 - 40W Synthetic	8700	$15.43	$20.06	$ .80	100	91	92	94	97	103	$1.72
Heavy Machine Shop	" "	2300	4.08	8.71	"	100	95	95	99	104	117	1.00
Welding Shop	" "	4000	7.10	11.73	"	100	84	81	82	84	89	2.37
Foundry	" "	3600	6.38	11.01	"	100	85	83	85	86	92	2.08
Foundry	2 - 40W Porcelain	3600	6.38	11.18	"	100	72	71	70	72	77	3.42
Foundry	2 - 90W Porcelain	3600	14.12	21.92	1.35	100	74	70	70	71	74	6.50

[1]All luminaires of the closed top industrial type except for single lamp aluminum troffers used in office.
[2]Operating cost includes lamp cost at 30% discount, labor cost of 50c per lamp replacement and electrical energy at 1½c per kwhr.
[3]Owning cost includes luminaire, installation and wiring costs amortized at 15% per year.
[4]Estimated — assumes depreciation at 25-month point is representative of mean depreciation with no cleaning.

cleaning schedule is most economical in all areas. However, with the sole exception of the aluminum troffer office luminaires, some cleaning is always justified. ***In most areas tested, either two or three cleanings per year produce the greatest economies.*** Even in the woodworking shop — a moderately clean industrial area — two cleanings per year reduces the overall cost of light 15 per cent as compared with no cleaning. For the same area, longer burning hours justify more frequent cleaning since the greater annual cost of lamps, labor and electrical energy increases the operating cost per luminaire.

Although the cleaning costs quoted may be typical for the north central industrial areas, regional wage differentials may alter this cost. Consequently the highest price paid for cleaning which would be economical for two cleanings per year, is shown in Column 8. If the cleaning cost is less than the amount shown, it is more economical to clean the luminaires twice a year than not at all. For plants where owning and operating costs differ widely from those shown here, calculations should be based on the particular costs involved.

Correlation Between Luminaire Dirt and Test Plates

The depreciation tests conducted on luminaires provided an excellent opportunity to determine whether a correlation might exist between the decrease in illumination and reflectance depreciation of test plates. In the heavy machine shop area small (4-inch by 4-inch) test plates were placed a few feet from the luminaires tested. The finish on both test plates and lighting units with synthetic enamel on steel. The test plates were installed in seven positions: 0° (horizontal surface facing upward), 30°, 60°, 90° (vertical), 120°, 150°, and 180° (horizontal surface facing downward). Losses in reflection factor are shown in Fig. 3, in comparison with depreciation of luminaires in the same area. The depreciation in reflectance of the 60° test plate is almost exactly twice as great as the depreciation of the luminaires. By interpolation, it is indicated that the depreciation of a test plate at about 80° inclination would probably coincide with the luminaire depreciation in this area.

The depreciation on the vertical plates was much less, relatively, than was found in previous investigations with transmittance of glass.[2] Other experiments reported by Oetting and Tuttle[3] suggest a

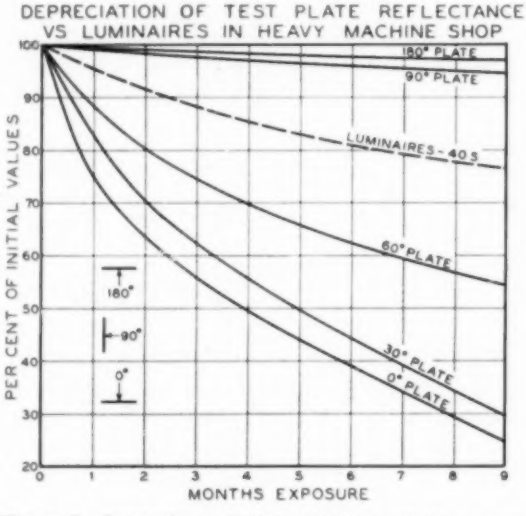


Figure 3. Comparison of dirt collection effects on test plates and luminaire in heavy machine shop.

more useful correlation with transmittance of plastic rather than reflectance depreciation. Further tests of these kinds are necessary to determine whether the correlations found are more than coincidental.

Summary

The field tests extending over a two-year period show the depreciation characteristics of fluorescent lamp luminaires in several industrial areas. From these realistic maintenance factors have been calculated. Since other localities might show different dirt collection rates, further studies are needed. Periodic cleaning produces a lower cost per maintained footcandle in most areas tested. A correlation was found to exist between test plate and luminaire depreciation in a machine shop area.

References

1. Egeler, C. E., and VandenBoom, R. F.: "Maintenance of Industrial Lighting," ILLUMINATING ENGINEERING, Vol. XLVI, p. 522 (1951).
2. Randall, W. C., and Martin, J. A.: "Making Your Window Deliver More Daylight," *I.E.S. Transactions*, Vol. XXII, p. 239 (1927).
3. Oetting, R. L., and Tuttle, J. W.: "Tests Aimed at Realistic Maintenance Factors," ILLUMINATING ENGINEERING, Vol. XLVIII, p. 242 (May 1953).

Light and Night Traffic Accidents

Discussion of paper by DAVID M. BALDWIN

(Published October 1953 issue of ILLUMINATING ENGINEERING)

WARD HARRISON*: There is a new element in the relationship between lighting and traffic accidents which gives me considerable concern. I refer to the new low light transmission glass that many automobile manufacturers are now putting in their windshields and windows on the basis that it will cut down unwanted radiant heat from the sun. Now I have nothing against the use of green glass in the side windows and many of you probably think that as far as the windshield is concerned the green is in the top only. The truth is, however, that down at eye level the green treated glass absorbs from 28 to as much as 36 per cent of the light, whereas clear safety glass absorbs 13 per cent. This means that the transmission of light is in the ratio of about .7 to .87, or in other words, that 25 per cent more powerful headlights are required and 25 per cent more powerful street lights are required at an expense of millions of dollars to make up for this catering to the whim of the public, which whim perhaps originated with the glass makers rather than with the automobile drivers.

Most street lighting and highway lighting is inadequate now, and lack of light is a killer. Statements that seeing distance is reduced only 6 per cent by the green in the windshield is misleading for that additional 10 to 30 feet in seeing distance may make the difference between avoiding a pedestrian and running him down.

The introduction of safely glass windshields some 30 years ago was a real step ahead but the ASA allowance of 30 per cent absorption for windshields is a relic of the day when clear safety glass was new and very difficult to make with high transmission. Happily those days are past. Shouldn't the National Safety Council and the I.E.S. Street Lighting Committee call for a review of this matter in an effort to see that higher transmission in windshields is made mandatory?

*Consulting Engineer, Cleveland, Ohio.

G. A. TROSPER**: The author has given us a very helpful resume of the effects of modern street and highway traffic in the severe toll of lives and property. Such reports help keep all of us motorists reminded that much of the time it is up to us to save the lives of others, as well as our own necks while we are driving.

Often, however, there are other factors that have a great deal of bearing on the case. Recently the insurance companies have reported on considerable studies that have been made concerning the responsibilities of drivers and have classified them into groups that should assume more responsibility or less responsibility. We hope this will result in substantial reductions in our automobile insurance rates especially for us who feel that the high cost of insurance for many accidents should be placed upon those responsible for them.

It is well that we as street lighting engineers review the causes whenever we can of various kinds of accidents, and to refrain from making statements that are not based upon fact when it comes to giving credit to lighting or any other factor that may assist in the reduction of accidents. We are severely criticized often because of statements made by persons who feel that lighting has been the greater contributor to modern safety programs. It is believed that we would do great harm to our efforts if we permitted such statements to continue. We can well agree with the author of this paper when he states that it is impossible "to assign any relative values to the influence exerted on the night accident rate by any of the factors mentioned."

By factual reports only will we able to prove that good street and highway lighting is effective in the reduction of accidents. It can be said that if a motorist has an opportunity to see an obstacle in his way at night in time to avoid an accident, credit must be given to some kind of artificial lighting.

**Pacific Gas and Electric Co., San Francisco, Calif.

H. E. Mason*: Mr. Baldwin's paper presents many interesting facts in connection with traffic accidents. Some of the factors involved had not come to my attention before, such as the average age of those who drive in the early morning hours and the severity of the accidents in those hours.

If the average man is like me, and I hope he is, he will need to go over the data in this paper two or three times to digest the facts about traffic accidents. Therefore in order that he who runs may read, and nowadays we are fairly flying, I would urge that most of these data be put in chart form even though the data are approximate and show only tendencies. It might mean a dozen or more simple charts but the casual and busy reader will look at each one, whereas he might skip such an article without charts.

I am told by those who invest in stocks that the chart which shows the average daily price of 50 stocks is the first thing that they look at on the stock page.

R. M. Swetland**: Mr. Baldwin is to be heartily commended for this most helpful factual discussion of recent traffic records, accident causes and suggested remedies.

Interestingly enough, a recent investigation of recorded traffic accidents over the past five years in an eastern city of 100,000 population very closely approximates Mr. Baldwin's national figures. That is, 38 per cent of the total accidents occurred at night; but 60 per cent of the total *fatalities* occurred at night. Thus attesting again to the increased severity of these night accidents.

We especially applaud Mr. Baldwin's last paragraph endorsement of "Improved street lighting for every urban area"— especially for the "high accident" streets.

Numerous street lighting surveys have disclosed that fully 50 per cent of all urban night fatalities occur on approximately 10 per cent of the total street mileage; or on these "high accident" streets.

Furthermore, it is found that approximately a 10 per cent *increase* in the annual street lighting budget usually will re-light this "high accident" group to I.E.S. recommended levels.

The resulting saving in economic loss, by a proven prevention of about 50 per cent of the night fatalities occurring on these "high acciden" streets may well range up to *15 times* the increased cost of this improved protective street lighting. Where else can a city obtain a better return on its investment.

David M. Baldwin*: The National Safety Council has been much concerned over the subject of tinted windshields. It would seem very desirable that drivers be able to take advantage of all the lighting provided by highway lighting and by automobile headlighting and, as Dr. Harrison points out, even a small percentage reduction in vision may mean the difference between an accident and no accident.

We would welcome a careful review of this situation and any joint action which would lead toward better seeing.

*Electrical Engineer, City of Philadelphia, Penna.
**Lighting and Rectifier Dept., General Electric Co., Lynn, Mass.

*Author: National Safety Council, Chicago, Ill.

The Development of Highway Lighting in Metropolitan Chicago and Northern Illinois

Discussion of paper by R. J. SEITZ and [illegible] M. PRIMS

(Published October 1953 issue of ILLUMINATING ENGINEERING)

Harold E. Mason*: All of us in the street lighting field are indebted to those who made trial installations of improved street lighting such as described in this paper. From these early trials the Standard Code Practice for street lighting has developed. The area covered in the paper includes Chicago, the nation's second city. It should be of interest to outline briefly some of the practices in Philadelphia, the nation's third city.

In 1948 the City of Philadelphia started a program of boulevard and expressway lighting. Profiting by the experience of others we made a trial installation of six 20,000-lumen mercury vapor lights on city property not generally open to the public. The installation was approved by engineers and city officials.

The public of Philadelphia did not see a single mercury vapor light until the Mayor turned on a complete installation of about 100 lights on the Vine Street Boulevard, one of the first important installations in our area. A year or so later the Mayor turned on a completed installation of 500 mercury vapor lights.

We have never permitted the public to see a so-called "half-baked" installation even during construction. The result is that the Philadelphia public is practically 100 per cent "sold" on mercury vapor and the only question that we get from them is how soon they can have more. If we had tried one or two lights on a downtown street, as has been done in some cities, the public reaction might have been unfavorable as it has been in these cities.

Vine Street now has *190* mercury vapor lights. On three routes leading to the Philadelphia International Airport we have *675* mercury vapor lights. On Broad Street which is one of the longest straight main streets in the world we now have *400* mercury vapor lights and will have *800* by the end of the year.

Now under construction is a section of Roosevelt Boulevard on U. S. Highway 1 which will have 660 mercury vapor lights. Also under construction is the extension of the Pennsylvania Turnpike into the heart of Philadelphia. Out-

*Electrical Engineer, City of Philadelphia, Penna.

side the city the Turnpike is lighted only at interchanges, but within the city it will be lighted by some 1500 mercury vapor lamps to a maintained average of .8 ft-c. Within the city it is known as the Schuylkill Expressway and will connect to the Vine Street and Roosevelt Boulevards as well as to other expressways.

These are only some of the main jobs completed or under way. We use quite a few 11,000-lumen mercury vapor lamps for access roads, narrow roads, and underpasses but, like the job for Edens Expressway described in the paper, most of our new lighting is horizontally mounted 20,000-lumen mercury vapor lamps 32 feet high.

In one particular our practice is different from that described for Edens Expressway. Our lighting standards are located two feet behind the curb line and we have also mostly standardized on 12-foot brackets to bring the light over the second lane of traffic.

We have been told by some engineers that this is unimportant but from our experience we think it is important. The longer brackets may cost a little more to purchase and install, and with lighting standards nearer the curb line there may be a small increase in the number of knockdowns. But we believe that the longer bracket produces a slightly better average illumination, a slightly better ratio of minimum to average for the whole street and for each traffic lane. On streets such as Broad Street and Roosevelt Boulevard it gets the light out beyond any trees and beyond the lane of parked automobiles. The boulevard looks less like two separate streets with one side lighting. The most important point in favor of the longer bracket is that the ability to see with the overhead light directly ahead of you is greatly improved, under both wet and dry pavement conditions. We believe that this is important for all modern street lighting installations.

K. M. Reid and D. A. Toenjes*: Recently Mr. Toenjes had the pleasure of inspecting this installation in the company of Mr. Prims. We offer these five joint comments:

(1) To those having responsibility of designing a lighting system for an expressway, this paper will be a helpful reference. There is, perhaps, one design detail on which a question might be raised. At the interchanges, where access roads enter or leave the main expressway, there are quite a few locations where two poles are only a few feet apart. At these locations one pole supports a luminaire lighting the expressway, while the nearby pole supports a luminaire lighting the access road. Question: Would it not have been satisfactory design — and more economical — at such locations to use double bracket arms on single poles?

(3) This Edens Expressway has been described (in the "American City Magazine," July 1953) as "Chicago's $23,000,000 super highway." Does this cost figure apply to the 14-mile length of the expressway, and was the expressway completed before any lighting was added? In any case, this cost figure suggests an interesting comparison: Can the authors tell us the approximate percentage increase in cost that resulted from adding lighting to this same 14-mile stretch?

(3) Do the authors have any comments on their choice of the 240-volt supply?

(4) We understand that the circuits are arranged, at present, to provide for the switching off of the alternate luminaires during the early-morning hours—1 a.m. to 5 a.m. Such part night burning is not usually to be considered good practice. The saving in lamp cost is very small. The saving in power — if the rate truly reflects power cost during the early morning off-peak hours — is also small. The cost of circuiting and controls is *increased*, and the remaining investment in lighting facilities is there even though unused. On an expressway, particularly, we believe reduced illumination during the early morning hours is dangerous business, literally. True, from 1 to 5 a.m. traffic volume is relatively low. Too, accident frequency is low. But average speeds are usually *higher* than at other times, and driver attention is likely to be below normal because of fatigue and, in some cases, by drinking. For those reasons, on most roadways both the accident *rate* per vehicle mile, and the accident severity, are at their peaks. We hope those responsible will decide to leave the full lighting in service all night.

(5) The authors are entitled to sincere thanks for including in the paper a record of the trial of low-mounted lighting on the Busse Highway. The trial was not successful, as they state. Nevertheless, they put it on record, for the information and guidance of others who might wish to experiment with low-mounted lighting. A salute to the authors!

W. S. Till*: In connection with the paper by Messrs. Seitz and Prims, I should like to ask the following question:

"Prior to relighting the Edens Expressway, was there any problem of extremely poor visibility in fog? Has lighting helped noticeably?"

C. A. Albini**: I have found whilst on the American Continent, it is not generally realized that in Britain automobile headlights are not used when driving at night on main streets. Side lights only are necessary by law. This is because it is considered that main streets are sufficiently illuminated (by the silhouette or surface brightness method) to show up obstructions.

The photo of Edens Expressway shown in this paper has made me wonder whether any tests had been carried out on some such well illuminated highway enforcing cars to proceed with sidelights only. This to determine whether glare from on-coming headlights contributes to accidents in any great measure.

I address my remarks also to Mr. Baldwin who, as Director of the Traffic Division of the National Safety Council, may wish to investigate this on a selected city road where headlights do not contribute towards visibility of the car driver. Such a test with the collaboration of the National Safety Council, Police Department and the driving public with a census of opinion from the latter, may show that headlights in the city cause more harm than good.

I would like to explain further that in Britain the levels of illumination on side (or residential) streets and main roads is so different — of the order of 4 to 1 — and the mounting height 15 feet compared with 25 feet that a driver is in no doubt as to when he should or should not use his headlights.

E. M. Prims*: I am glad to know that Mr. Mason has made some "test" installations in the past, and believe it would be well for others to consider such installations in the promotion of new products or new application of older products. I am not referring to small one, two or three

*Application Engineering Dept., Lamp Division, General Electric Co., Nela Park, Cleveland, Ohio.

*Commercial Engineering Dept., Westinghouse Electric Corp., Bloomfield, N. J.
**British General Electric Co., Montreal, Que.
*Co-author: Public Service Company Division, Commonwealth Edison Co., Northbrook, Ill.

pole jobs, but rather to larger installations which cover enough area so that a proper evaluation of the results may be obtained.

Setting poles two feet outside of a raised curb may be good practice in a city, but in the areas outside of a city where there are no such curbs, it would create a hazard for the motorist. The standards on Edens Expressway are 7 feet 6 inches back from the edge of the pavement but future designs will probably call for a 12-foot setback.

In answer to Mr. Reid and Mr. Toenjes, I would say that at a few locations where the highway and access road join, it would have been possible to install twin brackets on a single pole. I believe you will agree though, on seeing the installation, that single units do a better job of lighting. Incidentally, the minimum spacing between these units is about 25 feet.

The Expressway was open to the public before any lighting was installed. Fencing, landscaping and shoulder stabilization work was also done while the road was in use. The cost of the lighting system was a little less than 4 per cent of the total cost of the Expressway, including right-of-way, paving, bridges, fencing, lighting, etc.

Preliminary estimates indicated the cost of a series system with regulators and associated equipment was considerably more than a multiple system. Also specially trained men would be required for maintenance of the series system. These were the main reasons for selecting the multiple system. In order to avoid excessive voltage drop, to keep the cable as small as possible, and have a minimum number of power centers and to use standard ballasts, a 240/480-volt, three-wire grounded system was installed.

Economics was not, however, the major factor in the decision to use part-night circuits. It was felt that it would be good public relations policy to turn off every other light on the straight-a-way during the early morning hours when the traffic volume is low. After a little more operating experience is accumulated, I believe that the part-night circuits may be eliminated.

Dense fog is not common in the area of Edens Expressway, so the designers were not especially concerned with the problem. No study has been carried out, but at least one engineer had occasion to drive over the highway on a foggy night and remarked that the overhead lights provided considerable improvement in visibility. Obviously, however, a single experience is not conclusive evidence.

Electrical Characteristics of Lamps and Ballasts

Discussion of paper by W. CALVIN GUNGLE

(Published in November 1953 issue of ILLUMINATING ENGINEERING)

H. U. HJERMSTAD*: The data given in the paper by Mr. Gungle on rapid-start ballasts is very interesting and should prove to be helpful in the designing of circuits to operate rapid start lamps.

The effect of filament failure is certainly adequately described. Auxiliaries, lamp holders and lamps must be properly designed to permit the best operation of this lighting system.

In the instant-start type of lamp and ballast which has proved to be so popular, the customer has been severely penalized in that the ballast had to be designed so as to provide sufficient open circuit voltage to insure that the lamp would strike properly.

On a 48T12 lamp the open circuit voltage necessary is 425 volts for 118 volts primary. However, once the lamp has reached ionization and is operating at full current, the voltage drop across the lamp is only 100 volts. This large differential in open circuit voltage for striking purposes and low operating voltage has meant energy loss, largely in the form of heat to the ultimate consumer.

With rapid-start lamps an open circuit voltage of 300 volts will operate two 48T12 rapid-start lamps in series in which each lamp under normal conditions will have a 100-volt drop across it. In order words, the ballast is only required to take up or ballast 100 volts. Such a ballast becomes much more efficient since not only has the open circuit voltage been lowered but the starting current as well has been reduced to a few milliamperes since we no longer require that the arc stream shall cause the cathode to go from a cold cathode to a hot cathode and sustain the lamp as a hot cathode.

I think that one should also point out that if circuits are so designed that the common filament circuit (see Fig. 2) is a series circuit instead of a multiple one that failure of the common circuit in lamp #1 will cause a series cathode of lamp #2 to also fail but lamp #2 will try to glow since the entire open circuit voltage now appears across lamp #2 through the shunt capacitor. Such operation will cause this unheated cathode to deteriorate rapidly.

*Sola Electric Company, Chicago, Ill.

Photographing Fluorescent Lighting Installations in Color

By WILLARD ALLPHIN

THE LIGHTING engineer needs a technique for photographing, or directing the photography of fluorescent lighting installations in color. Definite filter recommendations for each of the seven fluorescent "white" colors have not been available from film manufacturers, for one reason because they feel that lamp colors have not been completely standardized within the industry. Actually, the colors have been standardized, but the specification limits are not as close as would be considered ideal from a standpoint of color photography.

However, the rendition of a lighting installation does not require the precise accuracy which would be needed in a scientific laboratory. Neither does it require the exact rendition of colors which would be necessary for photographing a work of art.

In fact, as will be discussed later, it would not even be desirable to present a technically literal rendition of the original scene. The goal of the lighting engineer should be to have the reproduction give a feeling of naturalness to those viewing it.

Films

Daylight color films are intended to be exposed in average sunlight on a clear day, thus including a mixture of sunlight and skylight.

Type A films are balanced for photoflood lamps at approximately 3400K and Type B films for 3200K lamps.

Viewing Methods

There are three principal methods of viewing miniature transparencies: by projection on a screen, in a hand-held viewer, and in a table-model viewer. There are also viewers which combine the first and third methods by projecting upon a ground glass in a table viewer. Large transparencies are viewed against transparency illuminators.

In projection, the 3400K characteristic of the projection lamp and the color of the screen determine the color with which the slide is viewed. Some recommendations for large transparency viewers go as high as 4000K, through the use of filters with tungsten or fluorescent lamps but table and hand viewers are usually below 3000K.

Acceptable Variations

Suppose we photograph an apple in sunlight on daylight film and view the resulting transparency in a standardized viewer. Then we photograph the same apple under photoflood illumination on Type A film and view it in the same viewer. Within the limitation of the process, the two transparencies will be identical. Nevertheless, the illumination *was* different in color. That is, it was different from a standpoint of physics, but not from a subjective standpoint.

Both times, when the photographer took the picture, the apple had an entirely natural appearance; therefore it is proper that the two transparencies should look the same in the viewer.

Our tendency to interpret the colors of a scene in terms of familiar cues has been called "approximate color constancy" and is of great help in compensating for physical discrepancies in color photography. If we view a transparency under conditions where there is no other illumination or where the general illumination is of the same color as the transparency illumination, we will accept rather wide variations in color balance without being aware of them.

As a practical example, however, this constancy is not sufficient to cover the case of a warm white fluorescent installation photographed on daylight film, without a filter, particularly if the wall colors are warm. In this case there is a reddish yellow cast to the photograph and the luminaires appear to be off color in the same direction.

In general, however, color constancy is sufficient to cover normal variations in color balance from one film package to another, normal variations from one fluorescent lamp to another of the same color, and a considerable spread in viewing conditions.

Procedure

The test pattern consisted of 10 strips of construction paper in different colors, a gray test card of 18 per cent reflectance and a white test card of

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 14-17, 1953, New York, N. Y. AUTHOR: Sylvania Electric Products, Inc., Salem, Mass.

90 per cent reflectance. The pattern was evenly illuminated by two 20-watt fluorescent lamps of the color under study, and was photographed and viewed against a dead black wall in a photometric darkroom.

Exposures were determined by taking a reading of reflected light from the 18 per cent card with a Weston Master meter, using the film speed recommended by the manufacturer. For each lamp color, exposures were made without a filter, and with the filter combination informally recommended by the film manufacturer from inspection of the spectral energy distribution curves of the lamps. Variations in exposure and in filter steps were also made for each lamp color.

Kodachrome films were processed by the film manufacturer. Ektachrome and Anscocolor films were processed by a commercial laboratory which was asked to exercise extreme care in the work.

Results were inspected in table-model viewers in which the lighting system had been rebuilt by substituting flashed opal glass for ground glass and burning the incandescent lamp 15 per cent over voltage. Brightness of the opal glass was 600 footlamberts, with a color temperature of approximately 3200K. Two identical viewers were used so that two slides could be compared with each other as well as with the test chart.

In inspecting the slides made under each color of fluorescent lamp, the test pattern was illuminated by fluorescent lamps of that color and the slide was selected which most nearly matched the test pattern. This was done by putting two slides in the viewers and glancing back and forth from slide to slide and from test pattern to slide until the better slide was determined. The other slide was then replaced by a third one and the process was repeated until the best match was obtained. The entire set of slides was then run through again while the test pattern was illuminated by a 100-watt daylight incandescent lamp. Again, from each set, the slide was selected which most nearly matched the test pattern. The daylight incandescent lamp, with a color temperature of approximately 3800K, was chosen as an easily duplicated compromise between daylight and ordinary incandescent lighting. As will be seen from the results, the color of illumination used when inspecting the test chart is not too critical. While most inspections were made by one observer, other observers were called in to check typical comparisons and were found to agree.

Results

In most cases where the colors matched most closely, the reproduction of the gray card and the white card seemed most free of color, but this was not always true.

It may be pointed out that comparing two slides at a time with the original chart offers a more severe test than would be given in ordinary usage where only one slide is seen at a time.

An interesting point is that, in most cases, the same slide was selected as best for a particular lamp color whether the inspection was made with the test pattern illuminated by the original source or by the daylight incandescent. When there was a difference, the recommendation was based upon the appearance of the chart under the daylight incandescent illumination because this called for filtering the exposure to a more "natural" appearance.

Putting it another way, consider an observer who is familiar with an interior lighted with cool white fluorescent lamps and another interior lighted with warm white fluorescent lamps. In still another room, under standardized viewing conditions, he will not remember the cool white room as being much bluer or the warm white one as being much yellower. Instead, if given a choice, he will prefer color slides which are almost identical for the two rooms.

Also, the presence of the luminaires in a lighting installation photograph is helpful in giving one more of the "cues" which we unconsciously employ in interpreting the colors at a scene.

Final results are incorporated as recommendations in Tables I, II, and III. Of course, the wily

TABLE I.—Filter Recommendations—35 mm Kodachrome Film.

	DAYLIGHT FILM		TYPE A FILM		
Lamp	Filters	Extra Stops	Filters	Extra Stops	Preferred Film Compared To Other
Daylight	None	0	*CC–40R+CC–50Y	3	Better
Cool White	*None	0	CC–40R+CC–20Y	1½	Better
Deluxe Cool White	*CC–20B+CC–20C	1½	None	0	Slightly better
White	*None	0	*CC–30R+CC–05Y	½	Equal
Warm White	CC–50B+CC–20M+CC–30C	2	CC–10Y+CC–20M	1	Much better
Deluxe Warm White	CC–50B+CC–50C	3	*None	0	Slightly better
Soft White	CC–40C+CC–10B	1	*None	1	Slightly better

*Preferred film.
Filter No. 85 may be used on Type A Kodachrome with the Daylight and Cool White with results practically as good as those indicated in Table I. No. 85 is the filter commonly used when using Type A Kodachrome in daylight.

TABLE II (Tentative).—Filter Recommendations—35 mm Anscocolor Film.

Lamp	DAYLIGHT FILM Filters	Extra Stops	TYPE A FILM Filters	Extra Stops	Preferred Film Compared To Other
Daylight	None	0	*CC–40R+CC–50Y	3	Better
Cool White	*None	0	CC–40R+CC–20Y	2/3	Better
Deluxe Cool White	*None	0	CC–20R+CC–40Y	2/3	Slightly better
White	*None	0	CC–30R+CC–05Y	1	Better
Warm White	CC–20B+CC–10C	2/3	*None	0	Better
Deluxe Warm White	CC–20B+CC–20C	1 1/3	*None	0	Slightly better
Soft White	None	0	*CC–50Y+CC–10Y	1	Better

*Preferred film.

TABLE III (Tentative).—Filter Recommendations—Ektachrome Sheet Film.

Lamp	DAYLIGHT FILM Filters	Extra Stops	TYPE B FILM Filters	Extra Stops	Film Compared Preferred To Other
Daylight	*None	0	*CC–40R+CC–50Y	3	Equal
Cool White	*None	0	CC–40R+CC–20Y	2/3	Better
Deluxe Cool White	*CC–20B+CC–20C	1	*CC–40R	1/3	Equal
White	CC–50B	2	*CC–30R+CC–05Y	2 1/3	Better
Warm White	CC–20B+CC–10C	2/3	CC–10Y+CC–20M	1	Better
Deluxe Warm White	*CC–50B+CC–50C	1 1/3	None	0	Better
Soft White	*CC–10B+CC–40C	1	None	0	Better

*Preferred film.

photographer will take one or two additional photographs giving longer exposures than are called for by the meter. "Bracketing the shots" would also call for a shorter exposure as well as a longer one, but this is unlikely to be needed in photographing lighting installations, since the room must look "well-lighted" even though the luminaires are overexposed. In fact, one rule of thumb when photographing interiors in color is "when in doubt, give more exposure." Also, while reading from a gray test card is good standardized procedure, it is well to correct for surroundings unusually light or unusually dark in tone.

The results in Table I are based on a large number of experimental exposures, varying filters and exposure time. They are offered as a working tool for photographers who photograph fluorescent lighting installations under the usual demands of the situation. Tables II and III are based on less data, a small number of variations from Table I having been tested for the additional film emulsions. Photographers are advised to put less re liance in Table II and III and to experiment with variations when necessary.

Table I should serve most of the practical needs for the present, since most color slides of lighting installations are made on 35 mm film and since the film covered in Table I is used almost universally in 35 mm stereo work.

The tables are based on film manufacturers' speed ratings and readings of reflected light from a gray test card of 18 per cent reflectance. Filters are Kodak Color Compensating type. Extra stops represent increased exposure over basic recommendation.

When presented at the National Technical Conference the paper will be illustrated by a sample slide of the test pattern and by various examples of slides made by following the recommendations in the tables.

DISCUSSION

TOM KNOWLES*: The photographer wishing to make color shots of fluorescent lighting installations is confronted with many variables. Some are controllable, others are not. Information on the response of color films exposed to the light of various "white" fluorescent lamps has in many cases been inadequate or non existent. Reproducability of colors by a color film will vary with the age of the film, exposure time, color characteristics of the light being used, and variations in the film itself which vary from emulsion to emulsion.

In this paper, Mr. Allphin has presented information to be used as a guide in correcting for the color balance of the film and he is to be commended for investigating this field where so little information has been available. His paper should prove quite helpful to the amateur, and also serve as a starting point for the professional photographer who must aim for the best results obtainable. I note that he recommends viewing the test slides by the light of a daylight filament lamp having a color temperature of 3800K. Inasmuch as most slides are for projection use, I feel that they should be matched by the light of a projection lamp color temperature of about 3300K. On the other hand, when viewing color films not for projection purposes, Messrs. Sorem and Nelson recommend 4000K. A very comprehensive paper by them appeared in the August 1953, issue of the *Journal of the Optical Society of America.*

From Mr. Allphin's paper I was unable to determine

*Professional photographer, General Electric Co., Nela Park, Cleveland, Ohio.

whether he is trying to reproduce the color balance as it appears in the scene or on the other hand to make the color slide look normal for any scene regardless of the type of fluorescent lighting that was used in taking the picture. By normal I mean that the white and gray tones are reproduced with no apparent color selectivity.

I feel that for single-picture use a normal rendering is desirable. Should a comparison be desired between two or more types of fluorescent lighting, then the reproduced picture should match the original scene insofar as possible. Accurate reproduction in color is only possible by making test exposures and using color compensating filters that are most suitable for the specific emulsion being used.

The author determines his exposure time by measuring the light reflected from an 18 per cent reflectance card. The gray card method may give good results when photographing interiors lighted to a high level. However, the meter deflection obtained under poor or low-level lighting conditions gives too small a reflection for good accuracy. I suggest the use of a 90 per cent White Kodak test card with a film index one-fifth normal rating. The use of incident light exposure determinations should give equally satisfactory results. The author says that "When in doubt give more exposure time." This is all right for black and white films with their great latitude; however, color films must be exposed correctly within ½ stop plus or minus. Over exposure produces washed-out transparencies that are of little value. Color films that are to be used for reproduction purposes should be on the darker side. This gives greater color sat-

I presented a paper before the I.E.S. Regional Conference at Syracuse, N. Y., last May entitled, "How to Photograph Lighting Installations." Although it dealt primarily with black and white photography, data on Type B Ektachrome color film were included. These data, in the accompanying table, based on about 300 test exposures, are compared to filter recommendations given by Mr. Allphin in Table III.

Discrepancies between the two sets of data may be due in part to the color sensitivities of the two different emulsions of Ektachrome B film.

Color photographic requirements of the amateur will tolerate wide variations of color balance. However, the professional, whose very existence depends upon excellence in his field may make preliminary tests on the particular emulsion he is to use, based on the latest filter recommendations available.

TABLE D-I.—Filter Recommendations—Ektachrome Film.

Lamp (Fluorescent)		CC Filters	Extra Stops
Daylight	WA	40R+50Y	3
	TK	85B+15M	1.5
Cool White	WA	40R+20Y	0.6
	TK	40M+50Y+10R	1.5
Deluxe Cool White	WA	40R	0.3
	TK	25M+40Y	0.7
White	WA	30R+5Y	2.3
	TK	30R+10Y	1.3
Warm White	WA	10Y+20M	1
	TK	25R+10Y	1.3
Deluxe Warm White	WA	None	0
	TK	05M+10Y	0
Soft White	WA	None	0
	TK	10R	0.4

WA — Willard Allphin
TK — Tom Knowles

WILLARD ALLPHIN*: Mr. Knowles' comments are helpful, and serve as a reminder that personal judgment enters largely into this tricky subject.

I am familiar with the Sorem and Nelson paper, but would point out that it deals primarily with large transparency illuminators. In the case of lighting installation slides, those which are not projected are most often viewed in a hand-held stereo viewer which uses a flashlight lamp for illumination. The value of 3200K was chosen as a compromise between the low color temperature of the flashlight lamp and the high value of 4000K.

Also, Mr. Knowles has evidently misread my paper. The test *slides* were not viewed by 3800K. They were viewed by 3200K while comparing them with the original *test chart*. The chart was illuminated with 3800K, for reasons given in the paper.

The third paragraph in the paper has been revised between preprint and final publication to clarify the point that I am trying to present the scene so that it will appear natural to the person viewing it. I suspect that Mr. Knowles must take some steps in this direction, even in his more technical work. Otherwise, he would use daylight Kodachrome or Ektachrome even for photographing incandescent lighting installations. As pointed out in the paper, Type A Kodachrome presents the result as the scene would have appeared if illuminated by daylight.

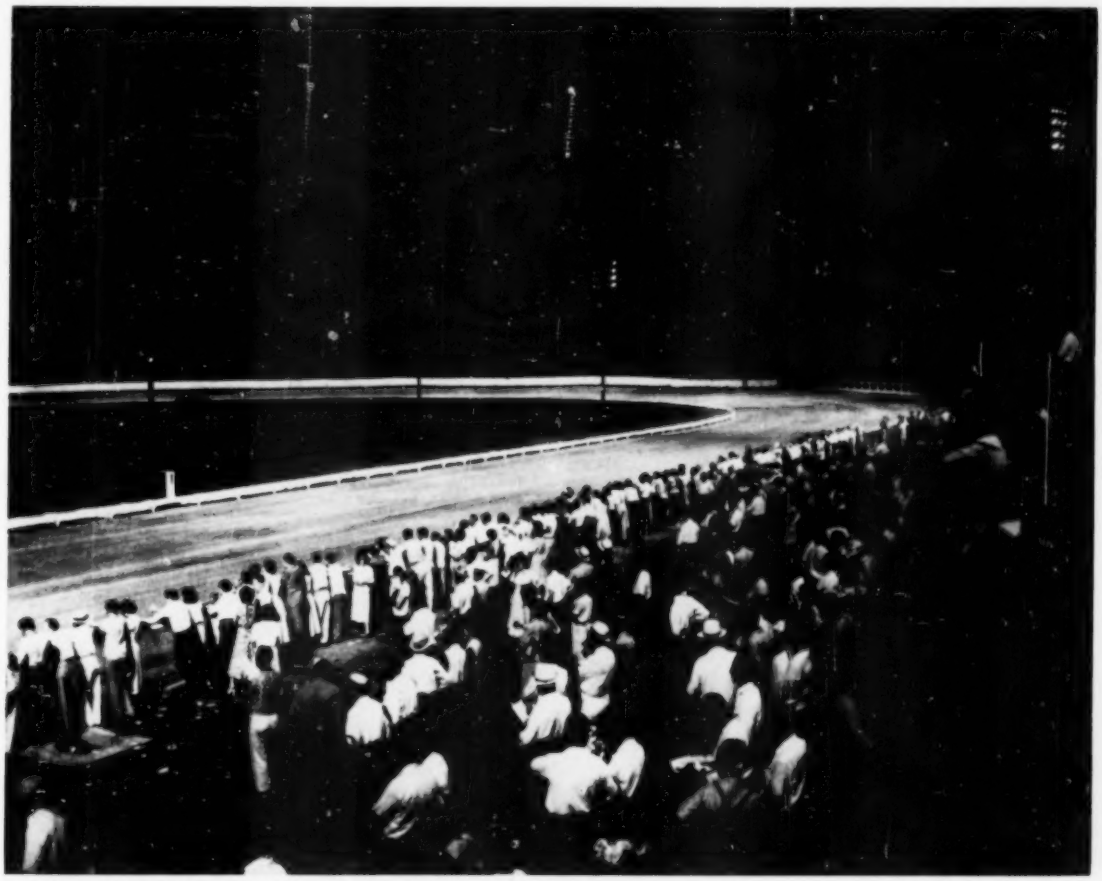
The Standard Eastman Test Card has a surface of 90 per cent reflectance on one side and 18 per cent on the other. The photographer uses whichever side is more convenient, considering the amount of illumination, and multiplies the indicated exposure by 5 if he has used the 90 per cent side.

It is agreed that color films should be exposed correctly to ½ stop. My, "When in doubt, give more exposure time," refers to the case where an important shot is to be "bracketed" by giving several exposures ½ stop apart.

The comparison between the two sets of recommendations for Type B Ektachrome film is interesting. We are not far apart in regard to the daylight lamp, since 85B is not a CC filter but is the one used to convert Type B Ektachrome for daylight use. Since I recommend daylight Ektachrome without a filter for this lamp, we differ only by the 15M filter.

We are in close agreement on white and fairly close on deluxe warm white and soft white, but far apart on cool white and deluxe cool white. Perhaps differences are in part due to variations between the products of one lamp manufacturer and another. This, and the differences between film emulsions pointed out by Mr. Knowles, serve to emphasize the fact that any such recommendations can only serve as a rough guide when critical work is involved. However, they should result in improved results even without preliminary testing for many lighting sales needs.

*Author.



INSTALLATION AT KENTUCKY STATE FAIRGROUNDS RACE TRACK, LOUISVILLE, KENTUCKY.

Floodlighting a Harness Race Track

LIGHTING OBJECTIVE: To provide shadowless, glare-free illumination so that horses and drivers can easily see to run the race, and to enable spectators to distinguish horses at any point on the track without the use of field glasses.

GENERAL INFORMATION: Trotting and pacing races are held on this half mile track at night. The owners of this track desired to have it rated as one of the best lighted race tracks in the country. There are facilities for approximately 10,000 spectators. Mean distance from spectators to track varies from about 120 feet on the home stretch to 610 feet on the back stretch.

LIGHTING INSTALLATION: Illumination is provided by 328 Westinghouse Type VRC floodlights containing 1500-watt lamps operated at 10 per cent over voltage, mounted on 14 tapered steel poles 80 feet above the home stretch and 60 feet above the back stretch and turns. The average maintained illumination on the back stretch and turns is 20 footcandles from the inside rail to the center of the track, and then falls off to about 7 footcandles at the outside. On the home stretch the total effective width of track is lighted uniformly with an illumination level of 30 footcandles. To reduce glare in the eyes of the horses and drivers due to direction of the floodlighting the

(over)

A.I.A. File No. 31

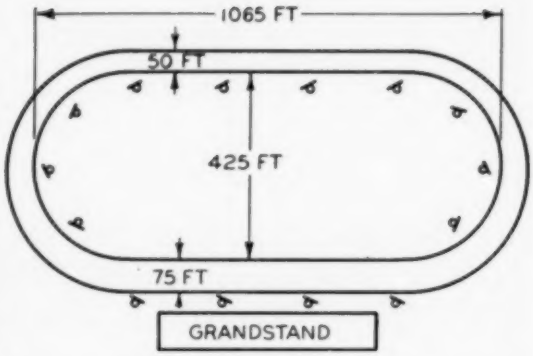


Figure 2. (left) Daytime view showing floodlight poles and grandstand.

Figure 3. (above) Plan view.

units are aimed to cover an area two-thirds in the direction of travel and one-third against the direction of travel. This reduces to a minimum the number of luminaires aimed toward the horse and driver while still maintaining high utilization. To increase the ease of locating the horses a white "reflector" fence is used to give a silhouette effect and to mark the boundaries. The relatively few floodlighting poles minimize interference to spectators watching the race.

Lighting data submitted by Merle E. Keck, Lighting Division, Westinghouse Electric Corp., Cleveland, Ohio, as an illustration of good lighting practice and to aid in the design of similar installations.

Published by the Committee on Publications of the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.

Effect of Ambient Temperature on Light Output of Fluorescent Lamps

By C. M. HOLDEN

AS RESEARCH continues and additional papers are published, more specific information is constantly becoming available. This means that increasingly accurate predictions of lighting installations can be made. A great majority of fluorescent installations are calculated using lumen output data available from lamp manufacturers. These lumens, in turn, are modified by the fixture, room and environment characteristics. A few layouts include the temperature factor. It is a well known fact that the lumen output of fluorescent lamps is a function of its ambient temperature. Due to internal pressure variations of the mercury vapor, the maximum light output occurs at an ambient temperature of approximately 80°F. Fig. 8-40 in the Second Edition of the *I.E.S. Lighting Handbook* graphically points this out, but on a general basis, with no specific lamps shown. Fig. 8-41 in the same edition, recognizes that various fixtures cause an ambient temperature rise due to their structure and lists typical values for different types of fixtures.[1]

Despite this accepted knowledge, very few lighting calculations include a definite consideration for such light output variations although temperatures may range from sub-zero to well over 100°. Perhaps because only information of a general nature was available. With this in mind, it was believed that an important service would be rendered the lighting industry if data on light output versus temperature could be supplied on specific fluorescent lamps of the more popular types in use today. This information would be provided by easily understood curves so that future installations could be more accurately calculated in keeping with the engineering aspects of the lighting profession.

The author has conducted many tests with specially designed equipment to determine the effects of temperature on the light output of various sizes and types of fluorescent lamps so that these data could be made available to the lighting engineer. These tests included 40-watt T12, 90- and 100-watt T17, bipin preheat, 96-inch T12 and 40-watt rapid start fluorescent lamps.

To obtain these data, a special box approximately 8 inches square by 8½ feet long was constructed which would contain any of these lamps. The inside of the box was covered with two coats of flat camera black paint. Two 500-watt strip heaters were mounted at the bottom of the box so they extended practically the entire length. An insulated platform was placed above the heaters to shield the lamps and the recording devices from the direct radiation of the heater strips. The space below this platform also provided the necessary room to place finely chopped dry ice in order to

A paper presented at the National Technical Conference of the Illuminating Engineering Society, September 14-17, 1953, New York, N. Y. AUTHOR: Commercial Engineering Dept., Champion Lamp Works, Lynn, Mass.

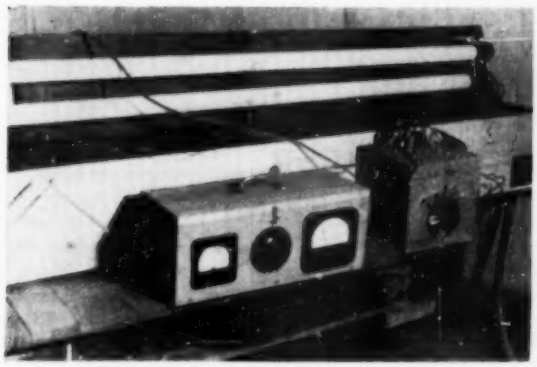


Figure 1.

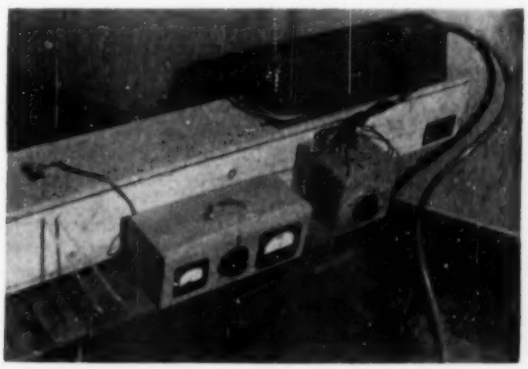


Figure 2.

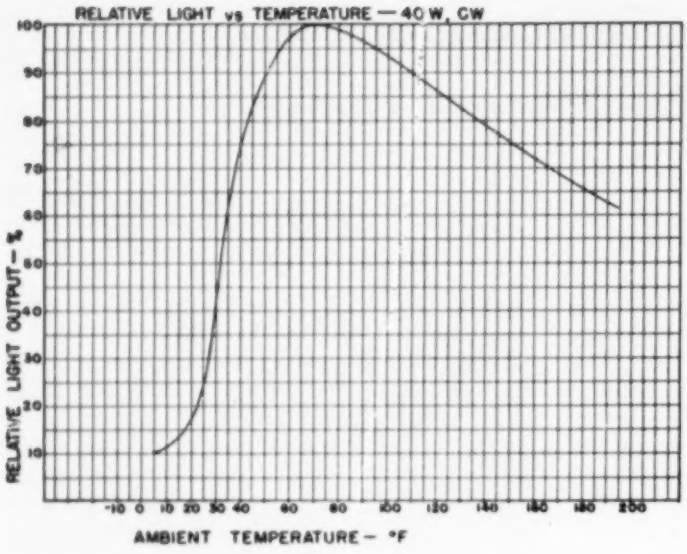


Figure 3.

obtain the low temperature measurements. Sockets were mounted on the lid of the box to accommodate two lamps of each of the types tested. Midway between these lamps, a slot was cut in the lid to accommodate a type PV1 light cell which was checked periodically during the test against a cell of known characteristics to obviate any inaccuracy which might be caused by exposure to extreme temperature. Fig. 1 shows the box open. Several thermometers were inserted in the box for comparison purposes. The ballast was placed in a separate box mounted over an opening in the lid of the main test box so that air circulation from the lamps was vented through the ballast enclosure.

The tests were conducted by placing the lamps and test equipment in a walk-in refrigerator twenty-four hours prior to the test run. To accelerate lowering lamp temperature when the box was packed with dry ice, a small blower fan was mounted in one end of the box so that the air from inside the walk-in type refrigerator, which was at 35°F, could be forced over the dry ice, around the lamps and out through the ballast box at the far end. This enabled lamp ambient temperatures of 40°F below zero and lower to be obtained.

On the day of the run, the box was packed with dry ice to the level of the platform, the lamps and circulating fan were started and left running for

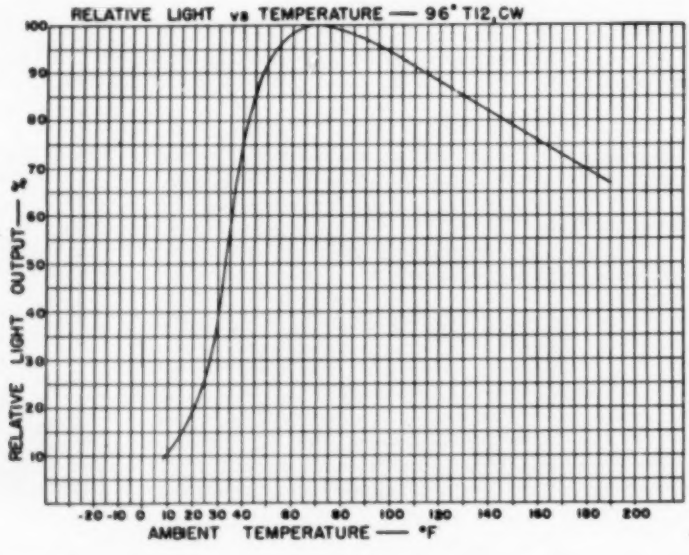


Figure 4.

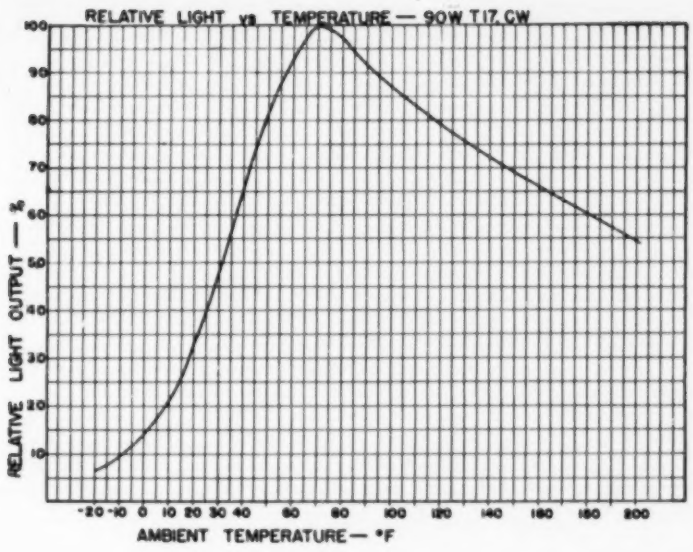


Figure 5.

one hour at the resulting sub-zero temperature. After this time, the fan was stopped and when sufficient time had elapsed to allow the air around the lamps to become relatively motionless, brightness readings were taken by means of the photovoltaic cell and shunted micro-ammeter. This brightness measuring apparatus was not calibrated for primary accuracy but did provide reproducible relative values. Fig. 2 shows the box and measuring arrangements. At each 5°F temperature step, light output at 110, 115, 120, 125 and 130 volts line were recorded. With this information, illumination values were available from both a voltage and temperature standpoint. Naturally, at low temperature values, no heater strips were required and the temperature rise was accomplished by a gradual warming of the cold air through the sides of the box. When the lamps reached a temperature of 35°F, the heating elements in the bottom of the box were turned on to accelerate the temperature rise. Readings were continued until the lamp ambient reached 200°F. Some data were also taken of the temperature in the ballast section. These in general, ranged from 10° warmer than the lamps on the low side of the test, to 10° cooler than the lamps on the high temperature end of the run. The ballast ambient, however, was found to have relatively little effect on lamp performance

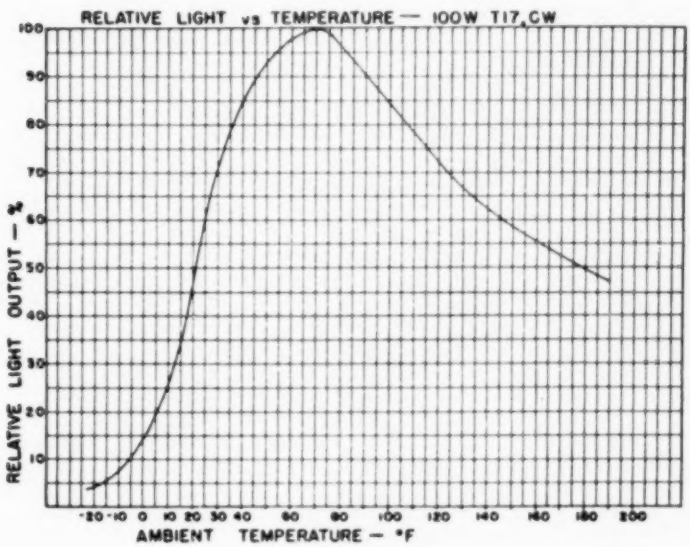


Figure 6.

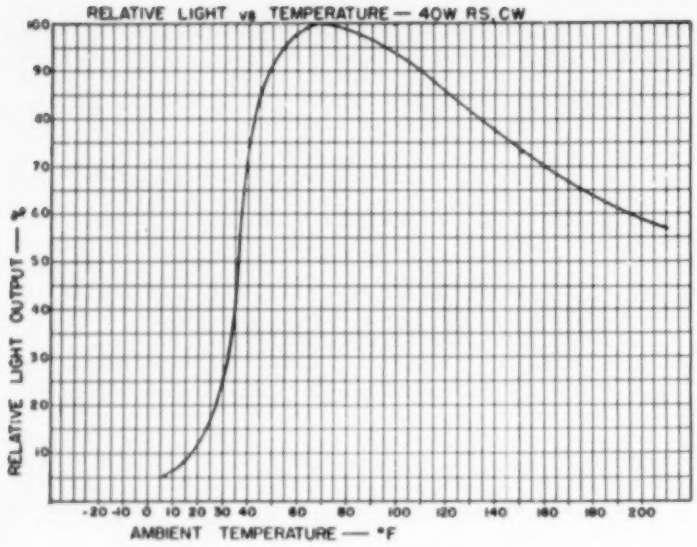


Figure 7.

and as a result, has not been included as an integral part of this paper.[2]

Figs. 3 through 7 provide average light output versus temperature curves for the five types of lamps investigated. Each curve is the average of several runs and their consistency with respect to the location of the maximum output point shows the accuracy of the relative data. Fig. 8 shows these five curves plotted on the same scale to bring out the comparison between the several types of lamps checked. It is these curves which the author hopes will be of real practical value to the lighting industry.

These tests confirm previous general knowledge regarding the effect of temperature on fluorescent lamp performances and the fact that low temperatures affect lamp output more drastically than higher temperatures. They provide concrete data which can be applied to specific lighting calculations. For indoor operation, ambient temperature at body height will range from 70 to 80°F. Lamps in their normal location near the ceiling will operate at temperature levels 10 to 15° higher than table height. The fixture enclosure increases this temperature still further. Consideration of the accumulative temperature conditions in a three-lamp closed end industrial unit might be as follows. Room temperature at desk height is 75°F. A 10° rise at fixture level would mean a fixture ambient of 85°F. The I.E.S. Handbook shows an increase

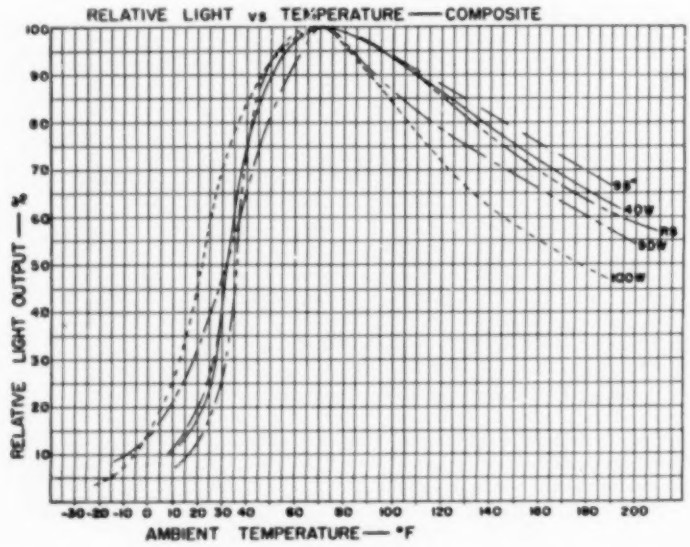


Figure 8.

TABLE I.—Tabulation of Per Cent Light *vs* Temperature for All Lamps Tested.

Average Relative Light Output

Ambient Temp. °F	40T12/CW Preheat	96"T12/CW Slimline	90T17/CW Preheat	100T17/CW Preheat	40W RS/CW Rapid Start
−20			6.5%	4%	
−10			9.5%	7.5%	
0			14%	14.25%	
10	11.5%	11%	21%	26%	5.75%
20	17%	19%	32.5%	46.5%	12%
30	40%	39.5%	48%	71%	26%
40	75%	76%	65.5%	84.5%	72.5%
50	89%	91.5%	81%	93%	92.5%
60	97.5%	98.5%	93%	98%	98.5%
70	100%	100%	100%	100%	100%
80	98.5%	99%	97%	96.5%	99%
90	96.5%	97%	91.5%	90%	96.75%
100	93.5%	94%	86.75%	84%	93.5%
110	90%	91%	83%	78%	90%
120	86%	88%	79%	72%	85.75%
130	82.5%	85%	75.75%	66.5%	81.5%
140	79%	82%	72.5%	62%	77.5%
150	75.5%	79%	69%	58.5%	73.75%
160	72%	76%	66%	55%	70%
170	68.5%	73%	63%	52%	66.75%
180	65.5%	70%	60%	49.5%	63.75%
190	62.5%	66.75%	57.25%	47.5%	61%
200					58.75%

of 35°F from fixture ambient to lamp ambient for this particular unit and lamp ambient would be in the vicinity of 120°F. Table I shows 72 per cent relative light output for the 100-watt T17 and 88 per cent for the 96-inch T12 at this temperature. Therefore, without any other considerations, the lamps are producing 12 per cent to 28 per cent less light than the maximum figures for these lamps. Some types of fixtures will produce appreciably higher lamp temperatures and some lower, but it is very obvious that more serious consideration must be given to this condition, which, for the lack of a better name, we might call the "Operation Factor."[3]

The author sincerely hopes that these data will now make available information which will enable the lighting engineers to design installations and predict their results with considerably greater accuracy for the benefit of all.

Bibliography

1. Forbes, J. C., and Diefenthaler, R. J.: "Effect of External Factors on Light Ouput of Fluorescent Sources," ILLUMINATING ENGINEERING, Vol. XLI, No. 10, p. 872 (December 1946).

2. Townsend, R. F. and Bachman, H. E.: "Starting Fluorescent Lamps and Low Ambient Temperature," ILLUMINATING ENGINEERING, Vol. XLVII, No. 4, p. 214 (April 1952).

3. Benson, B. S., Jr., and Church, E. H.: "The "X" Factors in Fluorescent Lighting," ILLUMINATING ENGINEERING, Vol. XLVI, No. 2, p. 53 (February 1951).

DISCUSSION

R. F. TOWNSEND*: The author has made a worthwhile contribution to the mounting fund of information on low temperature performance of fluorescent lamps. The specific lamp data in this paper can be combined with that on starting for the same type lamp shown in "Starting Fluorescent Lamps at Low Ambient Temperatures," by R. F. Townsend and H. E. Bachman, ILLUMINATING ENGINEERING, April 1952. This combination will enable a lighting engineer to predict with reasonable accuracy satisfactory starting requirements and light output characteristics in an application over a wide range of ambient temperatures.

We have noted that the curves of ambient temperature versus relative light output in this paper differ slightly from comparable curves on the same lamps run in our laboratory. An example is the 100-watt T-17 fluorescent lamp. A comparison of the 100-watt curve in this paper with that in the paper "Low Temperature Performance of Krypton Filled Fluorescent Lamps," by G. S. Evans, ILLUMINATING ENGINEERING, March 1950, shows light output peaks at different ambient temperatures and a slightly different rate of relative light output drop off at low and high ambient temperatures. These variations are due to two different methods of laboratory test procedure used, both of which could represent typical applications.

In view of the growing use of outdoor and other low ambient temperature applications of fluoresent lamps, it is recommended that a standard I.E.S. procedure be established by the proper Committee to obtain these light output data both for bare lamps and for lamp operation in service.

L. R. KEIFFER*: Everyone would probably agree with Mr. Holden that there is a very definite need for correlating the light output of fluorescent lamps in the fixture with the room temperature. This information is quite important even at normal room temperatures, as the light output of the lamps in hot fixtures may be far less than that which is expected and can be quite a factor in calculating illumination levels for new installations. The data obtained and Table I are a step in the right direction. However, there are a number of factors that require consideration. From a study of this particular paper, data of previous papers and various types of fixtures, it would seem that some of the data could easily be in error by 50 per cent.

There is always a question about what is meant by ambient temperature. Mr. Holden has given a very good example of variations in temperature at body height, near the ceiling and actual temperature inside a three-lamp closed-end industrial unit. However, the temperature of the air immediately surrounding lamps in a fixture for a given temperature near the ceiling can vary over a wide range depending on the design of the fixture, number of lamps in the fixture and types of lamps used and the operating current of the lamps. The effect of some of these variables is given in Fig. D-1 showing light output versus operating current, for a bare 96T8, one-lamp in a parabolic unit, a four-lamp industrial unit and a six-lamp industrial unit at a room temperature maintained at 80F. This data was taken by Diefenthaler and Forbes in connection with their paper presented in 1946.

The fact that the peak temperatures of all sizes of lamps occur at 70F is somewhat puzzling. This does not seem to agree with previously published data which generally show peak values occurring from around 50F to 80F ambient temperatures, depending upon the current loading of the lamp. A number of different tests over a period of years on 100-watt T17 lamps, show peak values on bare lamps occurring at an ambient temperature somewhat below 50F.

Apparently on this test Mr. Holden obtained readings at the various temperatures as the lamps warmed up from

*Commercial Engineering Dept., Westinghouse Lamp Division, Bloomfield, N. J.

*General Electric Co., Nela Park, Cleveland, Ohio.

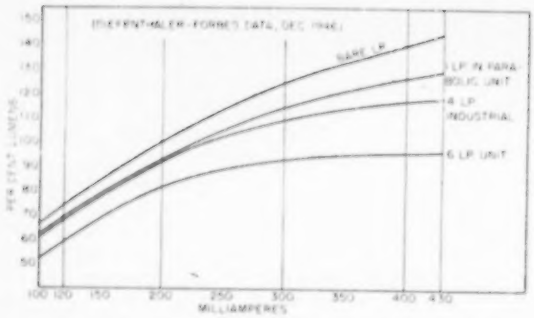


Figure D-1. 96T8 slimline lumens in per cent of 200 ma bare lamp under various conditions of operation.

a minus 50F value to the maximum of 190F. No information is given as to the length of time between readings or how rapidly this box warmed up. Since energy is being delivered to the lamps, the bulb wall temperature would lead the ambient temperature. Also, thermometers are quite sluggish and the ambient would be higher than indicated. These sources of error could be quite sizable. The light output would tend to be higher than indicated at both the lower and higher ambient temperature values. In tests of this nature, stabilization under draft-free conditions is desirable and this usually requires a constant surrounding temperature over an extended period of time.

The light output curve is dependent on the inner wall temperature of a fluorescent lamp. The curves for all lamps, if plotted on the basis of percentage in terms of maximum would be quite similar and the peak values would occur at nearly the same bulb wall temperature. The difference between bulb wall and near ambient varies with different lamps and the higher the normal bulb wall temperature, the greater is this differential.

As a constructive suggestion for practical use, possibly lighting units should have a Temperature Factor. This factor might be the difference in temperature in degrees F of the average bulb wall temperature of all lamps in the fixture as compared with the ambient temperature surrounding the fixture. This surrounding ambient temperature probably should be obtained in the same horizontal plane as the fixture and perhaps two feet away from the unit. Over a range of ambient temperatures from zero to 100F this value should be relatively constant, although the natural circulation around the lamps will vary with the design of the fixture and the ambient temperature. The bulb wall temperature measurement is suggested rather than the ambient immediately around the lamp, as the data on light output versus bulb wall temperature is quite accurate.

J. S. FRANKLIN*: This is a good paper to draw attention again to the temperature factor in the operation of fluorescent lamps and its application to practical problems. This subject will receive more and more attention in the years ahead.

The omission by the author of lamp bulb wall temperature measurement is regretted. Although they were not needed by the author for his primary purpose, they would have permitted correlation of basic data with other laboratories that have performed similar tests and also given the author a check on his results. It is hoped that in the future all persons undertaking such studies include lamp bulb wall temperature measurements as a regular part of their test data.

C. M. HOLDEN*: The comments received from Mr. Townsend, Mr. Keiffer, and Mr. Franklin are greatly appreciated and well considered. Primary concern seems to center around the difference noted between the 100-watt T17 data in this paper as compared to previously published material. This can be attributed to differences in measurement techniques but does a great deal toward emphasizing some of the variations that exist in actual installations.

Only a minimum of controls were set up in the collection of data for this paper in view of the unlimited operating conditions in the field. Any combination of controls would of necessity have only a limited field application.

The use of thermometers in checking the lamp ambient temperature was considered advisable in an effort to bring the resulting data into the realm of practical use by the field engineer or factory maintenance personnel. Consistent results probably could be obtained by using draft-free conditions and bulb wall temperature but these aspects limit the usefulness of this paper to the laboratory.

The popularity of the effect of temperature on fluorescent lamps seems to be on the increase as indicated by the number of papers presented on this subject at this national convention. Some standardization of procedure for such tests would do a great deal towards cross checking results obtained by various sources but the operating conditions and procedures for such a test would entail considerable thought and study to be of maximum benefit to the lighting industry.

If this paper has done nothing but excite thought by the reader on this problem, then it has achieved a far greater purpose than one which becomes automatically accepted.

*Author.

*Lighting & Rectifier Dept., General Electric Co., West Lynn, Mass.

Errata

Comparative Rating Guide for Fluorescent Lighting Fixtures — by L. V. James October 1953 ILLUMINATING ENGINEERING

For complete accuracy, the following changes should be made in the text of this paper:

Page 540, column 2, last paragraph under "Sample Luminaire," sentence should read: "Should there be a question as to whether this is the case, or as to whether the test data on the fixture are accurate, the right is reserved . . . " etc.

Page 542. Footnote should read: "Fixture costs in C1-A will be obtained from firm quotations in the bid or where they are covered in a complete electrical contract . . . " etc.

Page 547, column 2, third paragraph, delete the word "utility" from beginning of fifth line.

The General Secretary Reports

By C. C. KELLER

The Constitution of the Illuminating Engineering Society specifies that the General Secretary prepare each year a report on the Society's work, for publication in the Transactions. This report, based on material received from the Officers, Committees and Sections and Chapters, has been assembled with the assistance of headquarters. A preview of this annual report was presented at the National Technical Conference in New York September 14th.

Membership

Statistics. — Table I of this report shows the Society's present membership in comparison with figures for the past five years. These comparisons show a healthy increase in Member grade (an average net increase of about 100 annually during the past four years), and a steady slow growth in Associate Membership. Following the boom of Student enrollment in the post-war years, our enrollment in the Student Member grade has steadied down and of these, 15 transferred to Associate Member grade this year.

The growth in the Society's membership is shown in graphical form in the curves of Fig. 1. The total membership curve, shown in previous years has been broken into the major divisions to show through the years the growth in our Member and Associate Member groups. In Member Emeritus grade there are not many who reach this position of elder statesmen — and this year there were but two deemed worthy of this honorable reward by the Council — Dr. A. F. Dickerson and Mr. Chester L. Dows.

Members recommended by the Board of Fellows for election to Fellow grade, and chosen by the Council for this honor are as follows:

Joseph W. Bateman	William H. Kahler
Geo. R. Baumgartner	William P. Lowell, Jr.
Gillson W. Beals	H. J. C. Pearson
Ralph M. Evans	Wentworth M. Potter
Dean Farnsworth	Ernest H. Salter
Glenn A. Fry	George E. Shoemaker
Sylvester K. Guth	George J. Taylor
Eric B. Hallman	Carl W. Zersen

Table II of this report records the gains and losses for the year and the general accounting of changes in all grades of membership. The overall net increase was from 7,394 last October 1 to 7,795. Table III reports for the record the Society membership by Sections and Chapters, divided according to grade of membership. These figures offer a challenge to many local groups where there are possibilities for higher proportions in the Member and Fellow grade.

Campaign. — This year, with R. G. Slauer, Chairman of the Membership Committee, the new method of organizing the membership activities was continued for a record year. All Sections and Chapters were divided into four groups of comparable size—those with 200 or more members, those with 100 to 199, those from 50 to 99, and those under 50, not including Student Mem-

TABLE I.—Membership as of September 30.

	1948	1949	1950	1951	1952	1953
Members Emeritus	21*	26*	33*	32*	34*	32*
Fellows	45	44	40	42	41	70
Members	1,406	1,521	1,610	1,709	1,797	1,870
Associate Members	4,908	5,048	5,005	5,174	5,293	5,579
Student Members	136	244	369	209	229	244
Total	6,516	6,883	7,057	7,166	7,394	7,795
Fellows of the Society included	*3	*5	*9	*10	*11	*12

TABLE II.—Gains and Losses in Membership During Year Ending September 30, 1953.

	Members Emeritus	Fellows	Members	Associate Members	Student Members	Total
October 1, 1952	34	41	1,797	5,293	229	7,394
Gains						
Elections	0	0	86	921	112	1,119
Reinstatements	0	0	26	115	3	144
Transfers	2	30	77	15	0	124
Total Gains	2	30	189	1,051	115	1,387
Losses						
Resignations	0	0	41	305	20	366
Dropped	0	0	31	347	64	442
Deceased	4	0	13	37	0	54
Transfers	0	1	31	76	16	123
Total Losses	4	0	116	765	100	985
Net Change	−2	+29	+73	+286	+15	+402
Total Membership as of September 30, 1953	32*	70	1,870	5,579	244	7,795

*Includes 12 Fellows.

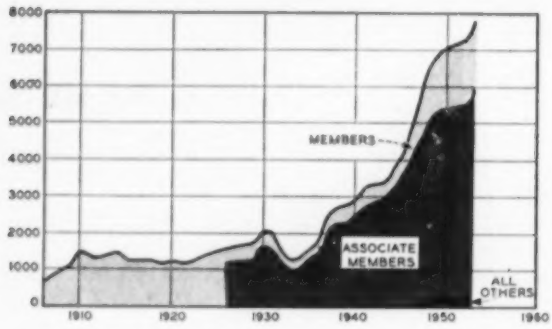


Figure 1. Membership of I.E.S.: Total, Members, Associate Members, all others.

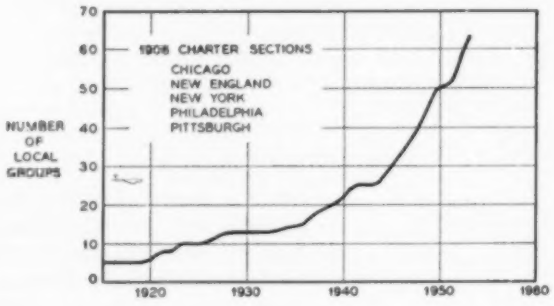


Figure 2. Growth of Sections and Chapters.

bers. Membership gains were evaluated in percentage of the October 1st membership, comparing only those Sections and Chapters within the same group. Not only did this method quickly show gains, it also singled out those places where resignations were above normal. The winners who received the cash prizes at the New York Conference are as follows:

Group I	Northern California	(first)
	Southern California	(second)
Group II	St. Louis	(first)
	Georgia	(second)
Group III	Indiana	(first)
	Arizona	(second)
Group IV	Mid-South	(first)
	New Mexico	(second)

The development of new Chapters has a very real effect on the results in the membership campaign. Northern California produced its record breaking first prize position entirely apart from the new growth at San Jose — which was established as a new Chapter in October. Southern California, however, had the benefit of the excellent growth at San Diego — which became a separate Chapter in July and did not appear in the campaign. Mid-South Chapter, newly established last October, deserves special mention for its continued growth leading to a first position by the end of the year.

Deceased.—The Society records with sorrow the death of 4 Members Emeritus, 13 Members, and 37 Associate Members during the fiscal year. Among these are three who have served as President of the Society and for whom Council recorded in its Minutes, memorial resolutions—Samuel Everett Doane, President 1919-1920; Clarence L. Law, President 1923-1924; Prof. Henry B. Dates, President 1937-1938.

Members Emeritus

Blackwell, William T.	Doane, Samuel Everett
Dates, Henry B.	Law, Clarence L.

Members

Bergh, A. C.	Mackasek, Louis
Blaisdell, L. T.	Peeples, Philip
Celis, Atilio	Robb, Charles M.
Dunn, Gano	Roberts, C. T.
Eagen, James Harold	Voelker, J. F.
Eisendrath, Benjamin	Wilt, M. C.
Horton, Benton O.	

Associate Members

Anderson, W. A.	Mackley, K. R.
Bergeron, Albert T.	Mandolos, Gus
Branham, Robert W.	McCabe, H. R.
Buxton, V. E.	Meder, Frank J.
Clifford, Percy William	Molitor, Arthur H.
Cohen, Albert	Morphis, B. W.
Crockett, W. R.	Parker, Vernon J.
Delany, Roy B.	Robinson, Leroy P.
Fitch, Joe M.	Salmon, Francis P.
Gardiner, Hamilton H.	Seybold, John Wesley
Gauchet, Clifford E.	Smith, Arnold M.
Gendall, Frank W.	Spillane, George J.
Hinwood, L. G.	Supple, J. M.
Honn, Leonard E.	Vedder, Kenneth T.
Hopkins, Theodore J.	Venning, R. R.
Jeter, G. Guy	Weber, Robert J.
Lomis, C. E.	Williams, Ralph
Lynde, Harry C.	Wolfe, Abraham J.
Lyon, R. W.	

Local Activities

The Local Activities Program was again under the general direction of the Junior Vice-President, Duncan M. Jones, and was carried out through the committee composed of the ten Regional Vice-Presidents. The program was much benefited through the general use of the Manual of Guides circulated to all local and regional officers before the beginning of the fiscal year.

The program of local activities of the Society is built around the regular monthly meetings of the Sections and Chapters. Beyond these monthly meetings, and the Regional Conferences and Residence Lighting Forums described later in this report, there are numerous special activities undertaken by the local groups of considerable importance, not only to the Society membership, but as well to the professional groups which cooperate.

Most significant perhaps were the Occupational Vision Conferences bringing together representatives of the several professions interested in education for the conservation of vision, and the study of means for increasing the efficiency, health and welfare of the industrial worker. Conferences in which the Society officially participated were held at Rutgers University, at Wilkes College (with Eastern Pennsylvania Section), at Michigan State College (with Michigan Section), at the Georgia Institute of Technology (with Georgia Section), and at the Rochester Institute of Technology (with the Rochester Section).

Practically every Section and Chapter operates a Study Club or one or more courses for the membership and for others who can be served by such instruction. Courses have been found very helpful in building up new Chapters, and such is the report for Arizona Chapter and Eastern New York Chap-

ter. Excellent courses were reported by a number of the Sections including Capital in cooperation with Electric Institute of Washington, Pittsburgh in cooperation with the Electric League of Western Pennsylvania, Northern California in cooperation with Northern California Electrical Bureau, and New England in cooperation with the Electric Institute of Boston's Lighting Bureau.

A number of local groups have set up activities of direct benefit to the student engineer or architect. Included among these are the Student Seminar at University of Detroit sponsored by the Michigan Section, the Architectural Student Lighting Design Competitions sponsored by the New York Section, the Southern California Section and the Philadelphia Section. An annual Illumination Institute was organized at the University of Wisconsin this year under the direction of Prof. L. C. Larson, local representative of the Society. This three-day program was for the purpose of enabling builders, architects, consulting engineers, electrical contractors, school and municipal officials and utility employees to become familiar with the increasing importance of proper illumination and lighting techniques.

As usual the Chicago Section operated an educational program which puts it almost in the class of a university. In addition to its full program of Section meetings Chicago held eight well-attended study club meetings and sponsored in cooperation with the Chicago Lighting Institute and others five one-day clinics, on Farm Lighting, Residential Lighting, Lighting for Stores and Merchandising, School Lighting and Industrial Lighting. And as is mentioned elsewhere the Chicago Residence Lighting Forum scheduled four excellent meetings.

Evidence of these excellent programs being carried on by our Sections and Chapters, and Regions, was given in the panel display of local activities at the New York Conference.

New Sections and Chapters.—Again this year the record of six new Chapters was achieved. In only two previous years in the Society's history has this been equalled. The Southern Region and South Pacific Coast Region each contributed two new Chapters and the other two were developed in the Midwestern and Pacific Northwest Regions. The remarkable growth of

TABLE III.—Membership of Sections and Chapters as of September 30, 1953.

	Members Emeritus	Fellows	Members	Associate Members	Student Members	Total
CANADIAN REGION						
Hamilton, Ontario Chapter	0	0	5	22	0	27
Maritime Chapter	0	0	7	26	0	33
Montreal Section	0	0	36	85	0	121
Ottawa Chapter	0	0	10	20	0	30
Quebec Chapter	0	0	9	38	0	47
Toronto Section	0	3	41	130	3	177
Winnipeg Chapter	0	0	9	46	0	55
EAST CENTRAL REGION						
Capital Section	2 (1 F)	2	42	59	0	105
Eastern Pennsylvania Section	1	0	45	116	0	162
Maryland Section	0	0	20	56	1	77
Philadelphia Section	1 (1 F)	4	82	210	2	299
Pittsburgh Section	0	0	54	142	2	198
GREAT LAKES REGION						
Central New York Section	1 (1 F)	1	30	82	1	115
Cleveland Section	5 (2 F)	18	108	211	17	359
Michigan Section	1	2	65	170	4	242
Northwestern Ohio Chapter	0	0	17	44	1	62
Ohio Valley Section	1	1	36	101	2	141
Rochester Section	0	2	12	67	0	81
Western Michigan Chapter	0	0	16	40	0	56
Western New York Section	0	1	11	61	2	75
INTER-MOUNTAIN REGION						
Arizona Chapter	0	0	12	45	0	57
New Mexico Chapter	0	0	6	26	0	32
Rocky Mountain Section	0	0	16	57	2	75
Southern Colorado Chapter	0	0	7	21	0	28
Utah Chapter	0	0	15	33	1	49
MIDWESTERN REGION						
Central Illinois Chapter	0	0	6	35	1	42
Chicago Section	5 (3 F)	4	127	378	29	543
Cornhusker Chapter	0	0	10	57	1	68
Heart of America Section	0	0	35	83	1	119
Indiana Chapter	0	1	22	84	2	109
Iowa Section	0	0	19	65	1	85
Milwaukee Section	0	0	27	154	4	185
St. Louis Section	0	0	27	172	1	200
Twin City Section	0	0	24	135	8	167
Twin Ports Chapter	0	0	6	26	0	32
NORTHEASTERN REGION						
Connecticut Section	3 (2 F)	2	34	109	2	150
Eastern New York Chapter	3 (1 F)	0	14	49	0	66
New England Section	2	8	75	258	3	346
New York Section	1	12	176	327	14	530
PACIFIC NORTHWEST REGION						
British Columbia Section	0	0	18	57	0	75
Inland Empire Chapter	0	0	6	46	1	53
Oregon Section	1	0	27	71	16	115
Puget Sound Section	0	0	22	73	2	97
Vancouver Island Chapter	0	0	5	21	0	26
SOUTHERN REGION						
Alabama Chapter	0	0	15	47	0	62
Carolinas Section	0	0	36	86	1	123
Florida Chapter	2 (1 F)	0	15	80	0	97
Georgia Section	0	0	47	95	2	144
Mid-South Chapter	0	1	14	50	59	124
Mississippi Chapter	0	0	6	24	5	35
New Orleans Section	0	0	18	73	2	93
Southeast Florida Chapter	0	0	8	53	20	81
Tennessee Valley Section	0	0	21	42	2	65
SOUTH PACIFIC COAST REGION						
Mother Lode Chapter	0	0	15	29	0	44
Northern California Section	1	1	60	194	4	260
San Diego Chapter	0	1	10	30	0	41
San Jose Chapter	0	1	10	27	4	42
Southern California Section	1	1	78	202	13	295
SOUTHWESTERN REGION						
Alamo Chapter	0	2	16	54	0	72
Oklahoma Chapter	0	0	15	39	0	54
San Jacinto Section	0	0	15	55	2	72
Southwestern Section	0	1	33	124	1	159
Foreign Non-Section	1	1	40	144	5	191
Mexico Chapter	0	0	7	23	0	30
TOTAL	32*	70	1,870	5,579	244	7,795

*Includes 12 Fellows of the Society.

these groups developed out of the fine efforts of our local representatives and nearby "parent" Sections. The new groups established by Council action are elsewhere in this report. There are now 63 local groups with 9 in Canada (2 in the Pacific Northwest Region of the Society), 53 in the United States and one in Mexico City. Some 17 of the Society's Chapters have met the three-year "age" requirement for transfer to Section status and of these eight more than meet the Constitutional requirements as to membership. However, during this year there were no transfers from Chapter to Section status.

Student Branches.—For the second successive year two new Student Branches were added to this group of the Society's local divisions. The Student Branch at the Southern College of Optometry in Memphis, was organized at the time the Mid-South Chapter was being formed. The Branch at the Oregon State College in Corvallis, was developed through the educational program of Prof. Delbert W. Shirley, Jr. These two new Branches make a total of eight such groups, four of which are active and four inactive.

Most Interesting Lighting Job Contests.—This activity jointly sponsored with the Lighting Service Committee, Lee E. Tayler as Chairman, continued to develop this year in size and importance. Thirty Sections and Chapters organized contests at the local level with 118 individual members competing. The winners at the local level provided outstanding sessions at the Regional Conferences. Each of the eight regions together with the winner of a special contest in the Northeastern Region were represented on the program at the New York Conference. The session devoted to the national competition was one of the outstanding features of the Conference. The winners received the cash prizes at the Conference Banquet, two competitors sharing fourth place. The prize winners were:

First.....Merrill R. Humber, South Pacific Coast Region, Northern California Section.

Second.....Nick Stuffer, Great Lakes Region, Cleveland Section.

Third.....Mario Zervigon, Southern Region, New Orleans Section.

Fourth.....Henry T. Koether, Midwestern Region, Milwaukee Section.
L. E. Spears, East Central Region, Pittsburgh Section.

New Chapters Established by Council Action During 1952-53.

No.	Chartered by Council Action	Name	Headquarters City	Region	Charter Officers
58	Oct. 9, 1952	San Jose	San Jose, Calif.	South Pacific Coast	William Addison, Chairman Vernon H. Lind, Secretary
59	Oct. 9, 1952	Mid-South	Memphis, Tenn.	Southern	M. E. Broom, Chairman Fred M. Niell, Secretary
60	Oct. 9, 1952	Twin Ports	Duluth, Minn.	Midwestern	George Spurbeck, Chairman Orvin Hanke, Secretary
61	Oct. 9, 1952	Vancouver Island	Victoria, B. C.	Pacific Northwest	Kenneth Reid, Chairman Sidney E. Jarvis, Secretary
62	Feb. 12, 1953	Alabama	Birmingham, Ala.	Southern	Walton T. Reeves, Chairman Aloys S. Shook, Secretary
63	July 2, 1953	San Diego	San Diego, Calif.	South Pacific Coast	C. M. Thompson, Chairman C. J. Bunce, Secretary

New Chapters Since 1944.

Region	Locals as of 10/1/44	New Locals 1944-53	Total	Per cent Increase
Canadian	2	5	7	350%
East Central	3	2	5	167
Great Lakes	4	4	8	200
*Inter-Mountain	1	4	5	500
Midwestern	5	5	10	200
Northeastern	3	1	4	133
Pacific Northwest	2	3	5	250
Southern	2	7	9	450
South Pacific Coast	2	3	5	250
Southwestern	1	3	4	400
Total	25	37	62	248

*Organized as a Region in 1951-52. (One non-Region Chapter—Mexico)

Residence Lighting Forums.—Forums continued to be a major activity in connection with the programs of five of the Society's Sections—Chicago, Georgia, Michigan, New York and Tennessee Valley. The newest of these Forums in Tennessee scheduled four meetings on an extension basis in four different cities to reach and serve all the membership in the group. Regular monthly programs were scheduled by most of the Forums and to these were added field trips such as in Atlanta to visit new homes with built-in lighting. The New York Forum was especially active this year including in its program the sponsorship of a lighting design competition for students at vocational high schools, and the scheduling of a series of 4 panel discussions on "Light — Its Effect on Human Beings — Physiological and Psychological," "The Use of Light to Create Art," "Lighting in the Development House," and "New Problems of Light Created by Contemporary Architecture."

At the New York National Technical Conference the five Forums cooperated, under the direction of the National Committee on Residence Lighting Forums, Edith Buchholtz, Chairman, in the presentations which were made at the Thursday morning session of the National Forum.

Regions.—The continued development of the local groups in all the regions seems good evidence for the growth prospects of the Society. Every region has had some new local group in the past ten years and some have more than doubled in that period. This is graphically shown in tabulation.

Regional Conferences.—Eight Conferences were held during the year equalling the excellent record of the previous year, with excellent attendance and fine programs. Conferences were not held in the Northeastern Region because of the planning of the National Technical Conefernce in New York, and the new Inter-Mountain Region did not feel ready to handle such a sizable gathering. The eight Conferences were as follows:

Canadian Regional Conference, March 23-24, 1953, Chateau Laurier, Ottawa, Ontario. Chairman, W. J. Montabone, Ahearn & Soper, Ltd.

Southwestern Regional Conference, April 12-14, 1953, Hotel Baker, Dallas, Texas. Co-Chairmen, Ralph Heitzman, Benjamin Electric Mfg. Co.; P. M. Rutherford, Jr., Dallas Power & Light Co.

South Pacific Coast Regional Conference, April 9-10, 1953, Edison Auditorium, Los Angeles, Calif. Chairman, T. H. Shepherd, Dept. of Water and Power.

Pacific Northwest Regional Conference, April 2-3, 1953, Benson Hotel, Portland, Oregon. Chairman, Walter E. Potter, General Electric Co.

Midwestern Regional Conference, April 30-May 1, 1953, Radisson Hotel, Minneapolis, Minn. Chairman, L. J. Riegert, Branham, Mareck & Duepner, Inc.

East Central Regional Conference, May 14-15, 1953, Lord Baltimore Hotel, Baltimore, Maryland. Chairman, E. S. Barrington, Westinghouse Electric Corp.

Southern Regional Conference, May 18-19, 1953, Sedgefield Inn, Greensboro, N. C. Co-Chairmen, A. L. Ducker, General Electric Co.; J. H. Welch, Jr., Duke Power Co.

Great Lakes Regional Conference, May 25-26, 1953, Syracuse Hotel, Syracuse, N. Y. Chairman, A. H. Clarke, Crouse-Hinds Co.

Regional Conferences represent the principal activity calling for cooperation of all Sections and Chapters in each Region. Distance proves a handicap for such cooperation in committee work as well as in participation by the local groups distant from the host Section or Chapter. As has been noted in recent years this places a burden on the host Section and attendance comes primarily from the host Section.

This year 47 out of 51 Sections and Chapters were represented at Conferences in the eight Regions. However, almost half of the total attendance was made up of members from the host group. It is anticipated that Regional Conferences will continue to increase in importance and as they do there will be an even further improvement in programs and general support by the membership.

Procedures and Policies

The committee with Charles H. Goddard as Chairman reviewed some of the Procedures and Policies of the Society assembled in the 1949 Manual and brought in several matters for Council's action.

I.E.S. Procedure—Internal and External Operation of the Board of Fellows. — A Revision in the method of submission and endorsement of Fellow nominations was first reviewed by Council Executive Committee in July 1952 and approved by Council at its October meeting. This was discussed again by Council at the February meeting leading to the adoption of a revision of the Fellow nomination form providing for the "proposal" of candidates rather than their "endorsement" and "recommendation without reservation." At the June meeting Council completed action on this subject detailing the procedure to be followed in the handling of confidential reference information to be requested from the five proposers and five references.

I.E.S. Procedure — Solicitation of Research Funds. — Included in President Hibben's Address before the 1952 Conference was the recommendation that the solicitation of research funds be united into that of sustaining membership (one committee) and that a substantial enlargement of sustaining membership income be planned with the understanding that all such income be handled to provide a substantial percentage in support of major research grants on a three- to five-year guaranteed basis. At its February meeting Council accepted the recommendation of the committee and adopted the following statement of policy:

—That such solicitations (whether mailings or personal contacts) should be presented to the subscriber on the basis that this is the only annual solicitation to be made by the Society and that such funds will be directed to the overall operations of the Society, including Research.

—That a descriptive and explanatory report be made which supports such solicitations with appropriate emphasis on Research—this report would be made annually and would be distributed each year to all sustaining members, including adequate coverage on all the Society's major activities. It should be made clear to sustaining members that the Society has been lending financial assistance to the Research fund and intends to continue this practice in the interest of basic and applied Research in the fields of vision and illumination. With this latter point in mind, the sustaining members should be encouraged to increase their general dues or subscriptions in order to make larger sums available for Research.

This policy was discussed by the Advance Planning Committee during the year and was recommended to Council as part of the committee report at the June meeting.

I.E.S. Procedure — Report on the President's Address. This subject was not considered by the Procedures and Policies Committee, but developed out of the report of the Committee on the President's Address appointed at the 1952 National Technical Conference. Included in the report of the 1952 Committee was the recommendation that the custom of reporting on the Annual Address of the President at each Conference, be discontinued. This was considered by Council Executive Committee at the November meeting and at its December meeting Council approved the Executive Committee's recommendation that the custom of appointing a special Committee to report on the President's Address, be discontinued, and that the Council Executive Committee be charged with responsibility of considering the recommendations in the President's Address at its first meeting in the fiscal year.

Constitution and By-Laws

The committee with Walter Sturrock as Chairman reviewed several amendments and actions were taken on these as follows:

Certificate of Membership (Council Minute 80, 90 (c)) Amended By-Law (c) Section 1 Article II — A Certificate of membership in the Society shall be issued by the General Secretary to any member in good standing, upon application and payment of $2.00.

Official Publication — ILLUMINATING ENGINEERING (Council Minute 28, 37, 80, 90 (b)).

Amended By-Laws, Article VII

(a) *Sec. 13:* The official publication of the Society shall be designated at ILLUMINATING ENGINEERING, including the Transactions of the Illuminating Engineering Society. It shall be published monthly.

(b) *Sec. 13:* From the annual dues paid by each member, not less than fifty percentum of the regular non-member subscription price shall be deducted and applied as a subscription to ILLUMINATING ENGINEERING, for the year covered by such payment.

(c) *Sec. 13:* The annual subscription to non-members shall be twelve dollars ($12) with an extra postage charge sufficient to cover mailing costs to all countries to which U. S. bulk postage rate does not apply. A discount of 15% from the subscription price of twelve dollars ($12) will be allowed to college and public libraries upon advance subscription sent directly to Society Headquarters; subscription agencies may be allowed a discount of 15%. Single copies when available are one dollar ($1) each.

Publications Committee (Council Minute 43, 80, 90 (a), 131) Amended Section 9, Article VII—The President shall, at the first meeting of the Council after he assumes office, appoint, subject to the approval of the Council, the following standing committees: The Executive Committee; a Committee on Finance, of three members; a Committee on Papers, of at least five members; a Committee on Publications of at least three members; a General Board of Examiners; a Board of Fellows, of six Fellows; and a Medal Award Committee. The members of the Executive Committee, Committee on Finance, and the General Board of Examiners shall be of Fellow or Member grade. A majority of the Papers Committee and of the Committee on Publications respectively shall be of Fellow or Member grade.

The President may also appoint, subject to the approval of the Council, special committees, general committees, and technical committees to report on scientific and engineering subjects. Chairmen of technical committees shall be of Fellow or Member grade.

Advance Planning

The Committee with C. C. Keller as Chairman had as its scope a study of the operation, program, publication activities, membership classification and financial structure of the Society with a view to immediate and long-range Society objectives. After almost two years of work the Committee produced a sizable report on a number of subjects and this was discussed thoroughly by Council at its June meeting. The subjects and their respective dispositions are summarized as follows:

1. The formation of a committee to plan long-range fundamental research. Council approved the recommendation in principle with the suggestions that the committee be appointed with its first assignment to study a proposed scope and program and to report to Council before proceeding.

2, 3. The combined solicitation of sustaining members' dues and research funds into a single annual solicitation, and that sustaining membership dues be applied solely to projects outside the regular Society operation, such as research. Council tabled these recommendations for further study.

4, 5, 6. The formation of a Regional Conference Committee to be responsible nationally for all regional conferences; the formation of a Regional Papers Committee to review and approve all regional conference papers, and a plan for national financial underwriting of regional conferences. Council referred these suggestions to the Committee on Local Activities for study and report.

7. The establishment of a Task Committee to study the headquarters operation with special reference to understudies for staff executives. Council approved this plan, suggesting such a committee be under the direction of the General Secretary, with the additional suggestion that such advisory personnel to the General Secretary could study this and all other operation problems.

8. The provision of funds to meet transportation expenses of officers to Council meetings and regional vice-presidents to each of their Sections and Chapters. This recommendation was referred to the Finance Committee for study and report.

9. The limitation of future Sections and Chapters to the U. S. and Canada and the reduction of foreign members' dues. The proposal to reduce dues for all members outside of the U. S. and Canada was approved and referred to the Constitution and By-Laws Committee for the preparation of appropriate amendments.

10. The publication of all Transactions of the Society in a separate section of the official publication, these Transactions to be also available in bound form on subscription. Council referred this recommendation to the Publications Committee.

11. The distribution of an annual report on activities and progress of the Society to all members. Council approved that this matter be given consideration as a Society policy.

Publications

The Publications Program was under the general direction of Duncan M. Jones, Chairman, and was carried out at headquarters by Ruby Redford, Editor and Clayton E. Ellis, Advertising and Sales Promotion Manager.

Editorial Program. — The Editorial aims of the Society's Journal have continued to be toward satisfying wider interests among the membership. During the year just past, further steps were taken in this direction, in the publication in ILLUMINATING ENGINEERING of all of the Society's Transactions, in addition to timely material covering current applications in lighting practice.

The series of articles reported last year on characteristics of materials used in the lighting industry was continued, and now includes plastics, porcelain enamel, baked enamel, Alzak aluminum, tungsten and acoustical materials. Current trends in numerous lighting fields were reported in articles and picture-caption spreads.

Two special issues of ILLUMINATING ENGINEERING were published during the year, the June issue devoted to a symposium on good school lighting practice based on the American Standard Practice of School Lighting, and the September issue containing abstracts of all National Technical Conference Papers. As a result of the interest in the June issue 3000 extra copies of the entire editorial section were reprinted for distribution.

The Lighting Data Sheet Committee this year initiated a very helpful procedure, working closely with Sections and Chapters and setting quotas for data sheet submissions. Some Sections and Chapters passed these quotas by a considerable figure. As this program develops it is expected to produce some very valuable application material from all local groups, aiding the Journal in reporting good lighting practice throughout the country.

Sales and Distribution Program. — An active program for the distribution of the Society's publications and the sale of advertising space in ILLUMINATING ENGINEERING was continued during the fiscal year with results equalling and in some cases exceeding the previous year. Publicity and Sales Promotion was developed for the following Technical Committee reports published in ILLUMINATING ENGINEERING and in reprint form — American

Standard Practice for Industrial Lighting, American Standard Practice for Street and Highway Lighting, Recommended Practice for Supplementary Lighting, and Lighting for Foundries. Over 10,000 copies of both the Industrial Lighting and the Street and Highway Lighting report have been distributed in this country, Canada, and abroad. In cooperation with the U. S. Department of Labor 10,000 reprints of the Standard Practice for Industrial Lighting were produced for the Department under the title "Industrial Lighting." A steady distribution of copies of the *I.E.S. Lighting Handbook*, second edition, continued through the year. The promotion of Society publications directly to the Society membership, at Section and Chapter meetings was continued, and considerably improved by the distribution of ten new portable publications display cases, one to each of the Regions. These cases will serve to display sample copies of publications as they circulate among the Sections and Chapters.

Supplementing the expanded editorial coverage, a wider scope of products was displayed in the advertising pages of ILLUMINATING ENGINEERING, and these pages maintained the high standard of factual and technical content.

Representatives to Other Organizations

During the year the Society maintained relations with other associations and agencies in the fields of science and standardization, through the appointment of official representatives. These included 22 members of the Society on 19 Sectional Committees of the American Standards Association with C. L. Crouch, Technical Director, serving in each case as an ex-officio member. Official representatives were also appointed to the following:

American Association for the Advancement of Science, Governing Board
Armed Services NRC Vision Committee
Edison Electric Institute—Working Committee on Light's Diamond Jubilee
Industry Committee in Connection with the Revision of "Handbook of Interior Wiring Design"
Institute of Traffic Engineers, Joint Committee on Highway Lighting
Inter-Society Color Council
National Committee on Traffic Safety
National Committee on Uniform Traffic Laws and Ordinances
National Engineering Advisory Committee
National Office Management Association, Committee on Physical and Physiological Factors
National Research Council, Division of Engineering and Industrial Research
National Research Council, National Academy of Sciences
National Research Council, Highway Research Board
President's Highway Safety Conference
Society of Motion Picture and Television Engineers
U. S. National Committee of the International Commission on Illumination
U. S. National Committee of International Electrotechnical Commission
Unity of the Engineering Profession—Exploratory Group

TABLE IV.—ILLUMINATING ENGINEERING Page Content by Subject Matter

October 1952 to September 1953.

Technical Conference Papers, Including Discussions and Abstracts	298
Technical Committee Reports	76
Other Technical Papers	119
Application Articles	137
Data Sheets	34
Telecast	136
Lists of Officers, Committee Personnel, and Sustaining Members	34
Advertising	304
Total Pages Published	1138

I.E.S. Research Fund

The administration of the Fund during 1952-53 was carried on through the services of the following men:

Board of Trustees

A. F. Wakefield, *Chairman*
Franklin M. Foote, *Treasurer*

Conrad Berens — S. G. Hibben
A. W. Deller — E. M. Strong
Ralph P. Wagner

Research Executive Committee

Ward Harrison, *Chairman*
C. L. Crouch, *Secretary*

Willard Allphin — Glenn A. Fry
Ralph M. Evans — Ward Harrison
Dean Farnsworth — R. M. Zabel

Reports published by the Society this year describing Fund sponsored research include:

"Controlling and Redirecting Daylight by Means of Louvers," H. S. Bull, University of Michigan (Project #2) January I. E.
"Relation of Critical Fusion Frequency to Fatigue in Reading," Ryan, Bitterman and Cottrell, Cornell University (Project #12) July I. E.

At the September 1953 Technical Conference one research report was presented:

Report on Project #37, "An Instrument for Evaluation of Night Visibility of Highways," A. E. Simmons and D. M. Finch.

Further work is being done on Project #30.

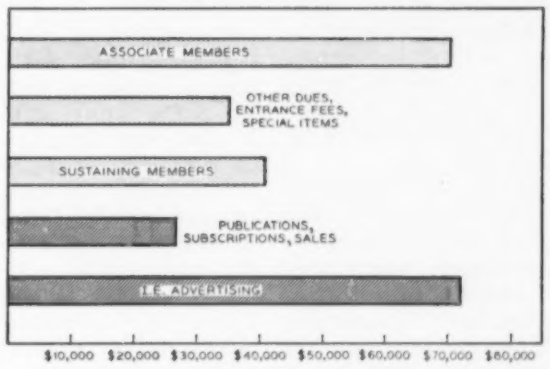
Upon recommendation of the Research Executive Committee, the Board balloted favorably on the following proposal:

Project #43, "An Investigation of the Relation of Changes in Pupil Size to Visual Discomfort," Glenn A. Fry, Ohio State University.

Two additional proposals are being considered.

Finance

Statements.—The complete financial picture for the fiscal year is in the auditor's report of income and expense, and the balance sheet. To visualize these sizable figures they have been converted to chart form showing the main divisions of the Society's financial support, the main divisions of the costs of Society services and a comparison of income and expense for the past three years.



Total of $245,910 in 1952-1953.

Figure 3. The Society's financial support.

Statement of Income and Expense for the Year Ending September 30, 1953.

INCOME

Annual Dues:		
Fellows	855.00	
Members	27,430.50	
Associate Members	70,865.50	
Student Members	1,134.75	
Entrance Fees	2,605.00	102,890.75
Sustaining Members		40,935.00
Sales, Publications, Gross		
Lighting Data Sheets, Binders	2,868.87	
Reprints	13,927.66	
ILLUMINATING ENGINEERING	8,824.15	
National Technical Conference Preprints (1952)	1,051.96	
Membership Roster	74.25	26,746.89
ILLUMINATING ENGINEERING, Advertising		72,207.31
Sales, Badges and Certificates, Gross		746.00
Investments		1,854.37
1953 National Technical Conference Income	12,720.00	
Less: Expense	12,214.06	505.94
Miscellaneous		24.51
Total Income		245,910.77

EXPENSE

General		3,987.69
Office, Business	43,385.18	
Office, Technical	33,095.27	
Office, Publications	38,436.65	114,917.10
Organization, Committees	1,526.58	
Sections and Chapters	22,194.51	
President's Travel	3,000.00	26,721.09
Sales, Badges and Certificates		599.25
Depreciation, Furniture and Fixtures	800.00	
Publications Stock	1,180.67	1,980.67
ILLUMINATING ENGINEERING, to membership		46,572.88
Sales, Publications, Cost of Stock		
Lighting Data Sheets, Binders	1,084.49	
Reprints	7,895.01	
ILLUMINATING ENGINEERING	5,553.79	
National Technical Conference Preprints (1952)	1,295.90	15,829.19
Sales, Publications, Stock, Services, Sales and Advertising Promotion		8,968.08
Retirement Pension Plan		3,702.21
Federal Social Security Tax		900.43
To I.E.S. Research Fund		5,000.00
Total Expense		229,178.59
NET INCOME		16,732.18

Committee Program. — During the year the Finance Committee with Marshall N. Waterman, Chairman, continued to discharge its constitutional responsibility for direct supervision of the financial affairs of the Society. This included the preparation of this year's operating budget and the recommendations to Council from time to time on investments, and special appropriations. The Committee also reviewed the financial reports for the 1952 Chicago Conference, and recommended the approval of the budget for the New York Conference.

Section and Chapter Budgets. — Assisted by the Committee on Local Activities, this committee also studied intensively the methods for arriving at satisfactory allotments from the general funds for Section and Chapter operation. This new procedure by which all Section and Chapter budget requests are first reviewed by the respective Regional Vice-President provided additional information and opinion on the subject, and as a result the Committee is recommending for 1953-54, a return to the formula method as an optional procedure for the submittal of budget requests. Needless to say, the revised budget formula attempts to realistically meet the increased operating costs of the Sections and Chapters.

Reserves.—As reported last year the Committee has continued to study the Society's position as to financial reserve. The history of the Society's finances shows that in recent years particularly, the Society has not been able to maintain the minimum reserve recommended in the By-Laws, equal to twenty-five per cent of current budgeted annual expenses. This year the Society was able to benefit from a favorable operating position, and upon authorization of Council the Treasurer, with the advice of the Committee, made further investments in government bonds and preferred stock of electric utilities. As a result the Society is now in a position where it has a reserve slightly above the minimum recommended in the By-Laws.

In view of the large increase in the size of the Society's operation, especially in the publications program, the Committee studied at length the subject of reserve necessary "to provide for security and continued operations of Society activities" — as was stated in the By-Laws many years ago when the 25 per cent minimum figure was established. Estimates were made of the effect on the Society's current financial operation of an assumed major, sharp recession. Data were also secured on the percentage reserves called for in the financial structure of other technical societies and associations. As a result of these studies the Committee is preparing for presentation to Council, a recommendation that the Society increase its minimum reserve figure to more nearly approach the provision of security and continuity desired.

Cost of Society's Services. — It has been a standing policy of your Society to convert practically all of the income from dues and other sources into services to the Society's membership and through them to the public. That the Society has practiced this policy is dramatically shown in the curves (Fig. 6) recording the increased outlay of funds in meeting the cost of services. With the Society doubling its membership in the last ten years, the expenditures for our Sections and Chapters and for the business operation of the Society have about doubled. The spectacular part of this chart is the evidence of the wonderful developments in the program of technical services and publications services. Since 1949 the expanded publications program has made possible not only vastly improved publications services to the membership, but has also provided a means for strengthening the Society's reserve position.

Standing Committees

The Constitution of the Society provides for the appointment of seven standing committees charged with the principal administrative functions of the Society. Reference to the work of the Publications Committee and Finance Committee appears in the early part of this report. Two of the standing committees are charged with the examination of qualifications for elec-

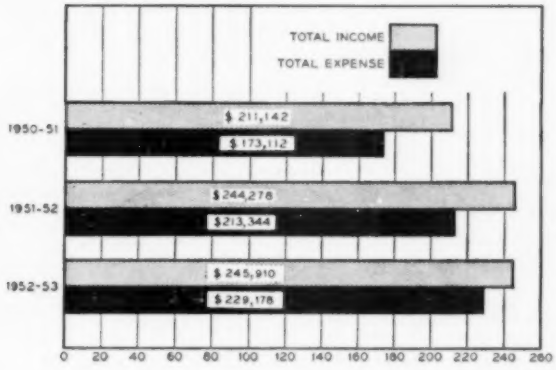
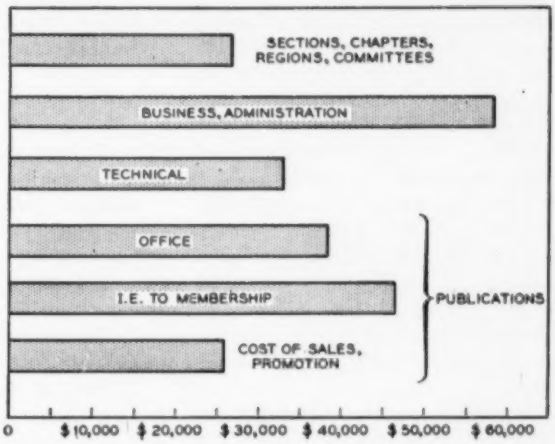


Figure 4. Comparison of income and expense.



Total of $229,178 in 1952-1953.

Figure 5. Cost of the Society's services.

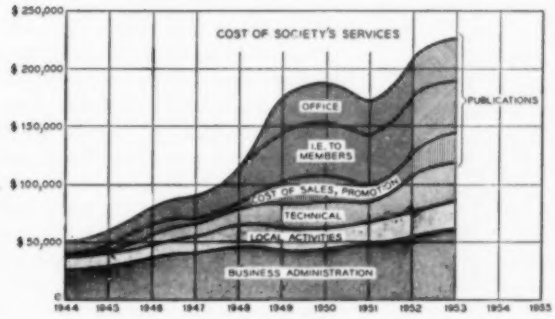


Figure 6. Trend in cost of Society's services.

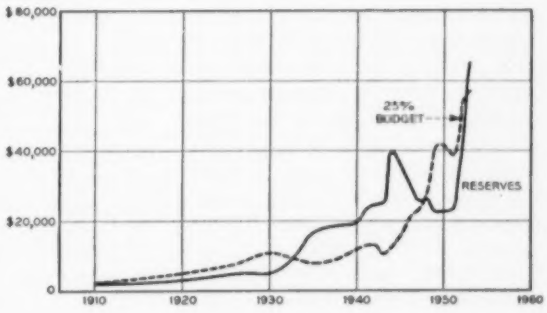


Figure 7. Trend in Society's reserves.

Balance Sheet — September 30, 1953.

ASSETS

Cash in Banks		63,102.68
Petty Cash Fund		300.00
Accounts Receivable		12,406.91
Investments (Cost)	54,037.50	
Accrued Increment — U. S. Savings Bonds	1,620.00	55,657.50
Inventories, Publications		16,731.41
Furniture and Fixtures	19,416.70	
Less: Reserve for Depreciation	8,651.66	10,765.04
Deferred Charges to Expense of 1953-54		
Sections and Chapters	2,854.96	
Illuminating Engineering	4,533.72	
General Office Expense	10,685.46	
Moving Expense	4,437.34	22,511.48
Accrued Interest on Investments		41.25
Total Assets		181,516.27

LIABILITIES AND SURPLUS

Liabilities		
Accounts Payable		9,878.87
Deferred Income		
Dues Received in Advance	1,192.41	
Subscriptions Received in Advance	3,006.16	
Conference Preprints (1953)	1,094.37	5,292.94
Surplus		166,344.46
Total Liabilities and Surplus		181,516.27

tion into the several grades of membership.

The balance of the standing committees are charged with their respective functions under the Constitution. These committees reported as follows below.

Council Executive

E. M. Strong, Chairman

Beyond conducting the routine affairs of the Society between Council meetings the Executive Committee studies and prepares for Council special matters requiring Council consideration. During the past year this included the recommendations in President Hibben's Annual Report, the special report of the Committee on the

President's Address, proposed amendments to the Society's By-Laws, the report on Unity in the Engineering Profession, and the Society's financial program involving reserves, investments and the annual budget.

Board of Fellows

Erwin F. Lowry, Chairman

The Board held two meetings — one in December and one in April with attendance of four and five members respectively. Only one of the six Board members was unable to be present at either meeting. Sixteen nominations for the grade of Fellow were approved and forwarded to the Council for action.

The Board is quite satisfied with the procedure as set up by Council for operation of the Board of Fellows. The charges which Council has made in these as requested by previous Boards seems to be effective.

General Board of Examiners

Clifford Miller, Chairman

The Board met monthly throughout the year and carefully reviewed the applications of all desiring election or reinstatement to Member grade. The Board also reviewed all Member grade resignations where there was a possibility of qualifying for election to the grade of Member Emeritus.

Medal Award

Howard L. Wright, Chairman

The committee met in New York on January 12, for a screening session as provided in the I.E.S. Procedure. While only four of the committee were present, and not a quorum, it was felt by those present that due to the distance traveled by each and to the timing required, they should proceed to screen the ten nominations in hand. This screening reduced the list to two candidates and the Chairman was directed to secure the necessary appraisals.

The entire committee was notified by mail of this action, furnished with copies of these appraisals and notified of a final meeting to be held March 30.

With six present at the Chicago meeting balloting failed to give either nominee the two-thirds majority required for election and the chairman was directed to conduct one letter ballot to all committee members. The results of this letter ballot with all members voting, still failed to give either nominee the required two-thirds majority. The committee therefore reported no nomination for the Gold Medal Award for this year.

Papers

R. M. Zabel, Chairman

In planning the program for the 1953 National Technical Conference, the committee reviewed over 50 papers in outline. Twenty-six of these outlines were accepted, the authors' manuscripts reviewed by the committee and papers approved for printing. Papers were grouped for session presentation and discussion was organized for each session.

In addition, the committee arranged two papers by invitation, with a special group for their discussion.

"Visual Fatigue with Special Reference to Lighting"—H. C. Weston, F.I.E.S., Director of Group, Research in Occupational Optics, Institute of Ophthalmology, University of London; Secretary of Vision Committee, Medical Research Council.

"Visual Factors in Lighting"*—W. S. Stiles, O.B.E., D.Sc., Department of Scientific and Industrial Research, National Physical Laboratory, Teddington, Middlesex, England.

Discussion

H. Richard Blackwell, Director, Vision Research Laboratory, University of Michigan.

Glenn A. Fry, Director, School of Optometry and Co-Director, Institute for Research in Vision, Ohio State University.

S. K. Guth, In Charge of Research, Lamp Division, Application Engineering Dept., General Electric Co., Cleveland.

Harry Helson, Dept. of Psychology, University of Texas.

Ward Harrison, President, Commission Internationale de l'Eclairage.

*Presentation by C. L. Crouch, Technical Director, I.E.S.

General Committees

The general committees of the Society are charged with all other operating functions of the Society which do not pertain to the preparation of reports on scientific and engineering subjects. Reference appears earlier in this report to the work of the Committee on Constitution and By-Laws, Lighting Service, Local Activities, Membership, Procedures and Policies, and Residence Lighting Forums. Two of the general committees functioned in connection with the annual election with responsibilities as specified in the Constitution and By-Laws, the Board of Nomination, Charles H. Goddard, Chairman, and the Committee of Tellers, W. H. Garrett, Chairman. The Advisory Board on Committee Personnel, with A. H. Manwaring, Chairman, again assisted in organizing committees for the incoming administration. The balance of the general committees reported as follows:

Defense Coordinating

A. F. Wakefield, G. D. Mills, Co-Chairmen

Progress in the projects already under way, and listed in the 1952 report continues, and additional projects are included in the committee's program, as follows:

#8. Negotiations for research for the Bureau of Ships recommended by Bureau for Research and Development (Former I.E.S. Research Fund Proposal #31).

#9. Coordination with Aviation Lighting Committee — R. C. Blatt, Chairman, "Successful in bringing Government and Industrial representatives together for pooling of technical information and techniques" (functioning).

#10. Wartime Conservation in Lighting Systems — C. E. Weitz, member of the Advisory Panel on Electrical Systems, NRC, BRAB, Division of Engineering and Industrial Research. (Project completed.)

#11. Research and Development Board project.

#12. Establishment of Searchlight Committee as Technical Committee of the Society.

#13. U. S. Naval New London Submarine Base, Medical Research Laboratory cooperative project with I.E.S. Research Fund on reflected glare.

Historical

S. G. Hibben, Chairman

Two of the activities of the preceding year were carried closely to completion; the history of the first decade of the Society, and the record material covering the story of the last half-century of the lighting fixture developments and highlights. A final draft of the history (and the appendix describing the official emblem or badge) has been circulated to key persons for criticisms, and it is hoped may be printed soon. The proposal to compile the luminaire history into a book is being studied, since all the essential material has been assembled.

Voice-recordings of the recollections of Past-Presidents proceed gradually; the committee is assisting in some of the plans of the Diamond Jubilee of Light and of the Golden Anniversary of our Society scheduled for 1956. A survey is being made, seeking a better and larger location for the library, and wider usage thereof.

National Technical Conference

Hoyt P. Steele, Chairman

The committee completed the organization of the Conference in New York and carried out with exceptional success at the Hotel Commodore during the week of September 14. Excellent results were obtained from the special efforts for press, and TV publicity. Numerous members of the professional and technical groups in the New York

metropolitan area responded to the guest invitations for one or more sessions of the Conference. Preliminary reports indicate a record-breaking registration and a favorable financial outcome for the Conference.

Plans were carried forward for the 1954 Conference scheduled in Atlantic City for September 12-16 and this Conference was well publicized in New York.

Conference Registration Records.

1943	New York, New York (1-day)	126
1944	Chicago, Illinois	721
1945	No Convention	.....
1946	Quebec, Quebec	807
1947	New Orleans, Louisiana	605
1948	Boston, Massachusetts	906
1949	French Lick, Indiana	668
1950	Pasadena, California	556
1951	Washington, D. C.	765
1952	Chicago, Illinois	859
1953	New York, New York	1,007

Public Relations and Information

J. S. Schuchert, Chairman

This committee, with Joseph S. Schuchert, Chairman, again this year carried out an extensive program of public relations and information under the general plans approved by Council in 1949. These activities have been carried on largely within the framework of headquarters personnel and committee membership thus avoiding the financial burden of an outside public relations and publicity agency. Committee members having experience or aptitude in these areas have contributed many creative ideas and together with headquarters have accomplished an extensive program.

The activities of the committee have been two-fold — internal, within the Society itself and external to the lighting industry, the electrical industry as a whole, and to the public. The efforts at the national level were supplemented by those of committees appointed in almost every Section and Chapter and equipped with a manual of instructional and publicity material.

The institutional "ads" in ILLUMINATING ENGINEERING are a principal effort toward the Society's whole membership; another is the series of News Letters over the signature of President Strong which go to some 1000 local and national officers and committee chairmen five times each year.

In the pattern of recent years the committee again prepared the well illustrated brochure, I.E.S. Dividends — a dramatic presentation of the accomplishments of the Society. This impressive folder served not only to acquaint a large part of the Society with its objectives and work, but also served as an excellent presentation to prospective individual and sustaining members.

Press releases at the national level as well as at the Section and Chapter meetings and Regional Conferences, are the principal means for external publicity. The work of the respective committees was effectively guided, especially by the newly prepared suggestions for publicizing the Regional Conferences. The committee reports an extensive collection of favorable reports, publicity clippings and other material resulting from its program.

Sustaining Membership

C. C. Shotwell, Chairman

The committee, under the general direction of C. C. Shotwell, Chairman, directed its efforts toward the election of new Sustaining Members and the further development of the Society's good relations with its Sustaining Members. To work with the national committee, chairmen were appointed in each Section and Chapter and these in turn formed local committees. The committee program was based on the official statement of I.E.S. Procedure adopted in 1949. Members of the committee were supplied with copies of the procedure and lists of members and prospects in their area with particular reference to the remaining electric utility prospects. The efforts toward new member elections were particularly successful in the Southern California Section. However, small gains in other areas were significant in relation to the prospects in those areas, as is shown:

Section/Chapter	Number New Elections	Per Cent Increase
British Columbia	1	100
Quebec	1	50
Southern California	6	43
Toronto	1	8
Chicago	4	6
Cleveland	1	5

Particular efforts were again made to keep the sustaining members informed as to the Society's program. Copies of the President's News Letters were sent on five occasions in the year and special letters accompanied the mailing to each sustaining member of the brochure I.E.S. Dividends based on the 1952 Society program, and reprints of the Lighting Progress Committee Report. All sustaining members were invited to suggest speakers available to address local and regional meetings. There was an excellent response permitting the distribution of a comprehensive speakers list to all local and regional officers.

The over-all result of the sustaining membership participation remains almost unchanged from the previous year, representing continued cooperation with the objectives of the Society.

Sustaining Members for Past Seven Years.

	Members	Dues Income
1947	314	$28,705.63
1948	326	30,209.37
1949	315	40,335.00
1950	316	40.235|00
1951	316	40,793.00
1952	335	41,735.00
1953	334	40,735.00

Technical Committees

The Constitution provides for the establishment of technical committees to report upon scientific and engineering subjects. The technical committee program was directed by A. H. Manwaring, Senior Vice-President, who was active in counseling the technical committees and in following their progress. The actual detail work was carried out by C. L. Crouch, Technical Director, and his capable associates at headquarters. Scheduled again this year was a two-day Technical Forum bringing together for a most successful meeting the chairmen of all technical committees. The forum proved to be a profitable interchange of committee experience, problems and planning, also serving as an excellent orientation for both old and new chairmen. Reports of the several committees on the 1952-1953 program follow.

Aviation Lighting

R. C. Blatt, Chairman

Several meetings of the Executive Committee were held during the year. Subcommittee chairmen reported on the activities of their groups and progress made toward the completion of subcommittee assignments.

The full committee met in connection with the Congress of Civil Aviation Conferences celebrating the 50th Anniversary of aviation. A panel of lighting engineers discussed airport lighting before the Congress. The committee sessions included the presentation of technical papers on aircraft lighting, aircraft marker lighting, and the lighting of the Pittsburgh Airport.

The status of the work of the various subcommittees is as follows:

Subcommittee on Aircraft Lighting — H. A. Cramer, Chairman. This subcommittee has done considerable work since it was re-organized on the design of instrument lighting and the calculating of lamp dimming resistance. Work on the Guide Report is nearing the completed final draft stage. This will be a complete outline on aircraft lighting and will be submitted for publication in the I.E.S. Lighting Handbook.

Subcommittee on Airport Lighting — L. C. Vipond, Chairman. This subcommittee has continued work chiefly on two developments, i.e., improved high intensity runway lights and better apron lighting.

Subcommittee on Approach Lighting —J. F. Angier, Chairman. This subcommittee was reactivated in 1951. The chairman is formulating plans for subcommittee activities.

Subcommittee on Apron and Ramp Floodlighting—H. N. McIntyre, Chairman. Considerable progress has been made toward a Recommended Guide on Airport Apron and Ramp Floodlighting. Subcommittee members are working on: definition of problems, mounting height limitations, available methods, louvering, supplementary lighting, and adapting Guth's BCD calculations for checking quality of jobs. Guide should be available soon in preliminary form. Final report will be published in the *I.E.S. Lighting Handbook*, as a CAA Lighting Bulletin or a TSO.

Subcommittee on Aviation Lamps — V. J. Roper, Chairman. The list of "Lamps for Aircraft, Aerodrome and Airway Lighting, I.E.S.-S.A.E. Recommended Practice" was accepted by the S.A.E. Bulb Committee and was included in the 1952 revised edition of the I.E.S. Lighting Handbook.

Subcommittee on Definitions and Terms—J. F. Angier, Chairman. This subcommittee has been working closely with that of the International Civil Aviation Organization (I.C.A.O.) on definitions and terms on lighting.

Subcommitte on Papers—R. E. Madigan, Chairman. This subcommittee has been working on the promotion of several papers for possible publication in ILLUMINATING ENGINEERING and also in other national aviation and electrical magazines.

Subcommittee on Program and Publicity — R. C. Blatt, Chairman. This subcommittee has reviewed the general program of the whole committee, and sought means for increased publicity.

Subcommittee on Research — F. C. Ashe, Chairman. The subcommittee is working with educational institutions in connection with study projects of committee interest for graduate research work.

Subcommittee on Taxiway Lighting — M. A. Warskow, Chairman. This subcommittee has continued work on taxiway lighting.

Central Station Properties, Lighting of

R. W. Corwin, Chairman

The committee completed the report "Lighting of Central Station High Bay Areas," third in a series which included "Lighting of Control Boards" and "Lighting of Dispatch Boards." Upon presentation at the April Council meeting the report was returned to the committee with Council's comments and suggestions.

Civil Defense, Lighting for

L. J. Schrenk, J. W. Bateman, Co-Chairmen

Two groups of lighting advisors have been appointed, one on the East Coast and one on the West Coast to be available to advise state and local groups regarding the requirements of illumination. Early in the year representatives of the East Coast group met with representatives of the Secretary of Defense and with a group from Federal Civil Defense to discuss proposed regulations for light control. Another meeting was held between the representatives of the East Coast group and the West Coast group from which several suggested modifications in the proposed regulations were developed. These regulations are being withheld by the Federal Civil Defense.

Color and Illumination

J. A. Meacham, Chairman

Three meetings of the committee were held during the year. At the initial meeting in November the objectives of the committee were outlined and sub-divided into three classifications and subcommittees were named to study each of these. At the March meeting, subcommittee chairmen presented preliminary findings and tentative outlines of the report they proposed. These were discussed in detail and suggestions offered for further study. The final meeting of the committee was held in New York during the National Technical Conference, and a full report to Council was discussed.

Daylighting

Robert A. Miller, Chairman

Chief activity of the committee, during the fiscal year, was the development of a Daylighting Technical Session at the 1953 National Technical Conference.

Farm Lighting

P. H. Hildebrand, Chairman

The committee has continued the assembly of information for a series of Farm Lighting Data Sheets including photographs and pertinent data on installations of lighting applications common to all farms.

Illumination Performance Recommendations

Ray P. Teele, Chairman

One meeting was held during the year, the rest of the work being carried on by correspondence.

A report covering the illumination performance of luminaires in all of the C.I.E. classifications is in preparation.

Light Control and Equipment Design

D. L. Williams, Chairman

The committee has about completed a tabulated guide which will be known as "Table of Materials and Finishes for Light Control" in which the commonly used metals, plastics, glasses and applied coatings will be tabulated and their pertinent engineering characteristics given. The committee is considering the supplemental information pertinent to the tabulated items for a detailed consideration of each topic to be compiled with proper references and bibliography as their future activity.

Light Sources

George S. Evans, Chairman

The committee continued as its principal project the preparation of a Question and Answer page on Light Sources for publication in ILLUMINATING ENGINEERING.

The committee also prepared the latest values for light source tables to be available for use in the second printing of the I.E.S. Lighting Handbook, 2nd edition.

The subcommittee on Color Rendition Properties of Light Sources continued its work of measuring and specifying such properties, particularly for fluorescent lamps.

Lighting Design Practice

J. Roy Jones, Chairman

The committee continued to study uniform methods of presenting and calculating illumination data and associated terminology.

During the past year the committee has devoted special study to methods of calculating coefficients of utilization, methods of classifying rooms according to shape, and the reflectance combinations for which coefficients of utilization are to be published.

Lighting Education

H. H. Magdsick, Chairman

The committee undertook two projects. One panel is making a comprehensive survey of the employment potential for people with professional training in illuminating engineering. All categories of employers are being covered to determine numbers required over the next five years, the functions they are expected to perform, and the employers' ideas as to desirable basic and specific training.

In the light of the results of this survey and past experience, the second panel is studying the content and organization of academic programs to equip men and women for effective professional performance without unduly limiting the range of opportunities that may be available to them in later life. This panel is also concerned with measures needed to provide greater scope, opportunity, and stability for those undertaking to teach in this field.

Lighting Maintenance

E. H. Church, Chairman

This committee is working on the redesign of a new Dirtometer. The work of the committee has been devoted entirely to the designing of this instrument.

Lighting Study Projects in Industry

A. A. Brainerd, Chairman

Two meetings, in December and April, were held for the committee during the year. At both meetings reports were presented by C. L. Crouch, Technical Director, on the progress of the pilot investigation of visual tasks in the textile industry being carried out in part at headquarters and in the field, in cooperation with the Subcommittee on Lighting in the Textile Industry, W. L. Kelley, Chairman. Also reported at the second meeting were the activities of a number of the other subcommittees which held meetings during January. These included:

Lighting in the Clothing Industry — Norman Kridel, Chairman. An analysis of the critical visual problems has been started.

Lighting in the Rubber Industry — L. O. Banahan, Chairman. Committee is in the process of organizing.

Lighting in the Sheet Metal Industry — F. W. Sell, Chairman. A study is being made of the use of localized lighting on presses.

Lighting in Steel Mills — A. Paulus, Chairman. Plans are being made for the study of lighting in rolling mills.

Lighting in Foundries — Frank E. Mueller, Chairman. The report of this committee having been approved by Council, the committee had in preparation a series of illustrations for publication with the report.

Other committees which continued studies during the year included:

Lighting in the Canning Industry — C. O. Martin, Chairman.

Lighting in Laundries — O. H. Hill, Jr., Chairman.

Supplementary Lighting — W. H. Kahler, Chairman.

Lighting in Saw Mills — James Barnes, Chairman.

Lighting Study Projects in Public Buildings and Private Institutions

Robert S. Rogge, Chairman

No reports were submitted to Council during the year. A preliminary report by one subcommittee has been circulated among the main committee and is now being prepared in its final form for submitting to Council.

A meeting of the main committee members with the subcommittee chairmen was held in connection with the National Technical Conference.

Following are the reports of the subcommittees:

Lighting in Auditoriums and Churches —Edward Rambusch, Chairman. The East Coast group reports that two informal meetings and one meeting with full attendance have been held during the year on the subject of architectural lighting.

Lighting in Hospitals — Howard Haynes, Chairman. Field tests are continuing in the study of Patient Room Lighting. Tests on one phase of patient room lighting, hospital bed lighting, are nearly completed. During the year, the chairman of the committee authored an article, Hospital Lighting, in the July 1952 issue of Progressive Architecture. This article reflects many thoughts of the committee's studies to date.

Lighting in Hotels — C. I. Sayles, Chairman. The committee's report is nearing completion. Two copies of the report have been compiled and the subject matter is in its third review.

Lighting in Kitchens, Lunchrooms, Cafeterias and Dining Areas — Carl Zersen, Chairman. The final report on the Kitchen Area is in the process of being compiled. The preliminary report on the Kitchen Area was circulated among the main committee members for review and comments. In June a joint meeting of this committee and its advisory group from the National Restaurant Association was held to present the results of the researches and investigations on the lighting of each of the seven work areas normally found in a restaurant kitchen.

Lighting in Theaters — R. T. Dorsey, Chairman. The subcommittee is working toward producing a report on lighting study for school stages, cosponsored with the School Lighting Committee. Task groups have been established to handle various phases of the subject.

Mine Lighting

C. M. Crysler, Chairman

The committee has made a considerable number of measurements in various mines to determine present conditions, and some experimental work is being carried out by the U. S. Bureau of Mines as a result of the committee's recommendation. The principal meeting of the year was held in May in Cleveland.

Nomenclature

D. M. Finch, Chairman

A committee meeting was held in Washington, D. C. in January. The prior year's activities were reviewed and the draft of a paper on basic concepts and quantities prepared by the chairman was discussed. The material has now been published in the July 1953 issue of Illuminating Engineering. Other aspects of the official nomenclature were considered includ-

ing the sections dealing with U.V. radiation, color, illuminants, classes and characteristics of illumination, photometric standards and tests, aeronautical lighting and quality and quantity concepts. Each of the above subjects was assigned to a committee member as a special project for study and report.

An International Illumination Vocabulary has been prepared by the Swiss Committee of the C.I.E. This material has been reviewed by this committee and a report has been forwarded to the Secretariat. The review occupied a considerable amount of the committee's time since the vocabulary and definitions were voluminous and a July deadline had to be met.

Office Lighting

J. J. Neidhart, Chairman

The committee is now preparing and reviewing a first draft of a new Recommended Practice.

Progress

Theodore C. Sargent, Chairman

The committee maintained contact with the art of lighting throughout the world and prepared the yearly review of the achievements in the art of lighting for publication in ILLUMINATING ENGINEERING. This review was given a dramatic presentation as one of the features of the 1953 New York National Technical Conference.

Protective Lighting

J. W. Lee, Chairman

The committee has maintained contact with the distribution of its report the American War Standard "Protective Lighting for Industrial Properties A-85, 1952."

Public Conveyances—Interior Lighting

E. W. Beggs, Chairman

The subcommittee on Marine Lighting has been active, having an inspection trip and meeting on board the U. S. Norfolk. The committee is making progress toward a report on ship lighting. The subcommittee on the Lighting of Railroad Cars, Trolleys and Buses organized in 1952 under the chairmanship of J. L. Swarner is planning its activities.

Research

Willard Allphin, Chairman

The committee was re-appointed during the year and began to plan its program for the survey of all significant research dealing with the application of light and lighting and its effect upon the performance and comfort of human beings.

Residence Lighting

Mary E. Webber, Chairman

The committee held three two-day meetings during the year and brought to completion two projects which were carried over from last year, as follows:

Recommended Practice for Residence Lighting. This complete revision was approved by Council at the April meeting and was published in nearly-complete form in the August issue of ILLUMINATING ENGINEERING.

Residence Lighting Resource List. This report was completed and ready for Council approval at the October 1953 meeting. It provides for enlarging the access to material on home lighting.

Dormitory Study Room Survey. The committee questionnaire on this subject prepared last year was distributed last Fall by the Technical Director. The returned data have been tabulated this year by Bruce J. Jensen, but the decision as to its use and the publication of a booklet on the subject has been tabled.

Allied Arts Competitions on Home Design. The committee reviewed with interest the Cleveland Section's 1952-53 activity in a Collaborative Student Competition. The current year's competition in Cleveland was devoted to the design of a small home, and this committee immediately saw the potentialities for faster progress in the art and science of lighting in the home through expansion of allied arts activities in more Society Chapters and Sections. It proposes to fully study the subject and to provide, if possible, a prospectus to stimulate and guide other Chapters and Sections in undertaking similar cooperative efforts with the architectural and design societies.

School Lighting

J. M. Chorlton, Chairman

The committee continued its review of seeing and lighting problems in educational institutions in the selected fields for study projects, including Bibliography of School Lighting, Brightness Conditions in Educational Visual Environments, Chalkboards, Student Vision and Scholarship and Visual Problems.

Signal Lighting, Elements of

F. C. Breckenridge, Chairman

An outline has been received for the material on the Properties of the Eye. This outline showed that the material covers a much broader span of subject matter than the other single chapters of the compendium and the Editorial Board, therefore, decided to devote the entire Part 2 to the Properties of the Eye. This part is to be prepared by Dr. H. R. Blackwell, Executive Secretary of the N.R.C. Vision Committee. This change has required other changes in the outline and Part 3 will now be devoted to the Properties of the Atmosphere. It will consist of two chapters, one of which has already been prepared by Mr. W. E. K. Middleton of the Canadian National Research Council. The other chapter has been promised by Mr. L. B. Harrison of the U. S. Weather Bureau. In accordance with the new outline Part 4 will bring together the information given in Parts 2 and 3 in a practical form for ready application under the title Visual Range of Signal Lights. Mr. C. A. Douglas of the National Bureau of Standards is undertaking to prepare this part. There has been no change in the committee's plans with reference to Parts 5 and 7. Part 6 was published last year.

Sports and Recreational Area Lighting

A. H. Clarke, Chairman

The committee held a two-day meeting at Syracuse, in August and made a physical inspection of the lighting of three gymnasiums. The committee also inspected the lighting of the ¾-mile harness race track at Vernon, New York, including the lighting of the track itself, the photofinish lighting, and miscellaneous areas such as the paddock and parking. Following this the committee approved layouts for a number of sports lighting installations and suggested others as a basis for further study.

Standards of Quality and Quantity for Interior Illumination

Sylvester K. Guth, Chairman

The committee is reviewing the available information pertaining to permissible brightness of lighting equipments and the relation between these brightnesses and the task brightness. An interim report which will revise and bring up to date that part of Report No. 1, Brightness and Brightness

Ratios, which deals with this aspect of the problem is in preparation.

Store Lighting

R. C. Allison, Chairman

Four meetings of the committee were held during the year devoted to the revision of the Recommended Practice for Stores and other Merchandising Areas.

Street and Highway Lighting

F. D. Wyatt, Chairman

The committee has engaged in numerous activities during the year holding a two-day meeting in Atlanta, Ga., where that city's re-lighting project was inspected. The committee contributed heavily to the organization of a technical papers session for the New York Conference. A special subcommittee was appointed to study visibility under fog conditions such as exist on the New Jersey Turnpike. Other subcommittees, through whom the whole committee functioned during the year were as follows: Coordination, Special Committee on I.E.S. Lighting Handbook, Special Committee on Interchange with Foreign Groups, Low Level Lighting, Mercury Vapor Lamps, Pavement Surfaces and Safety Lighting, Photographic Studies, Program and Publicity, Research, Public Lighting and Traffic Safety, Sign Traffic Lighting, Tunnel and Underpass Lighting, Revision of 1927 Report Principles of Lighting, Standard Practice, Liaison Subcommittee — International City Managers' Association.

Television Production

H. A. Kliegl, Chairman

The committee has been working on a number of projects in three subcommittees—Measurements and Illumination Values for T.V. Production, Fundamentals of T.V. Lighting Equipment Design and Application, Standardization of Lamp Design for T.V. Application.

Television Viewing

E. W. Commery, Chairman

This committee is continuing its activities in connection with obtaining survey information regarding the television viewing and lighting habits in the home.

Testing Procedures for Illumination Characteristics

G. A. Horton, Chairman

The committee reports progress as follows on its principal assignments:

1. Revision of "I.E.S. Guide for Electrical Measurements of Fluorescent Lamps — 1948," completed in March 1953, by a subcommittee under the chairmanship of Arthur Weeks and approved by Council, following presentation at the April meeting.

2. Preparation of "I.E.S. General Guide on Photometry." The second draft dated March 1953, submitted by R. P. Teele, was reviewed by the committee and suggested changes will be incorporated into the third draft which will be returned to the committee for its further consideration. In addition to this guide which is highly theoretical, the committee felt that a practical guide should also be prepared.

3. Preparation of "I.E.S. Guide for Photometric Testing of Searchlights." The preliminary draft and first draft were reviewed by the committee, suggestions and changes worked up into a second draft in July 1953, by a subcommittee headed by A. E. Krawcek.

4. Preparation of "I.E.S. Guide for the Photometric Testing of Fluorescent Street Lighting Luminaires." A first draft was submitted in February 1953, by J. E. Bock, but the writing of the final guide is being held in abeyance pending the accumulation of practical experience with this method.

5. Review for revision—"Report of Committee on Photoelectric Portable Photometers." First draft which was prepared in March 1952, is still under committee study.

6. Revision along the lines of the I.E.S. Guides to Testing Procedures — "Testing Specifications for Lighting Equipment." I. Diffusing Enclosing Glassware; III. Asymmetric Show Window Reflectors; IV. Direct, Indirect and Semi-Indirect Luminaires. With regard to Number Six, parts I and IV were combined into a single guide entitled — "I.E.S. Guide for the Photometric Testing of Filament Type Luminaires." When the stage of the third draft was reached, progress was temporarily halted pending determination of its dependence upon Number Two above. For Part III, suggestions were obtained from the manufacturers of this type of equipment for incorporation into a first draft.

7. Preparation of "I.E.S. Guide for Computing Lumen Distribution and Isolux Diagram on a Horizontal Plane from the Standard Floodlight Photometric Test Report." Under study by committee.

8. The Subcommittee on Brightness Measurements held one meeting and formulated plans to prepare an "I.E.S. Guide on Brightness Measurements."

Task Committees

Joint I.E.S.-A.S.H.V.E.

Walter Sturrock, Chairman

This committee was asked to explore and define problems of mutual interest and study the areas in which the two societies can collaborate. In its report the committee submitted a list of 12 items of mutual interest, and recommended that they be given further study by a joint I.E.S.-A.S.H.V.E. Technical Committee on "Thermal Aspects of the Lighting System." An outline of an initial assignment of research for such a committee is included in the report.

Joint I.E.S.-U. S. Public Health Service

J. F. Parsons, Chairman

The assigned project of this committe, the preparation of material for a publication, "How to Make an Eye Conservation Survey," was completed in November 1952. The text is now being circulated among various medical authorities for comment. This project was originally undertaken at the request of the U. S. Public Health Service and was intended for use primarily by field engineers of that organization as an aid to promoting realization of the importance of proper visual environments in the contacts of their representatives with Federal, State and Municipal authorities, and with private industry. The text is divided into two parts, Part I on Illumination and Part II on Vision, the latter prepared by physicians of the Public Health Service.

Light's Diamond Jubilee — 1954

R. F. Hartenstein, Chairman

The committee kept in touch with the plans of the Jubilee Executive Committee and scheduled a luncheon meeting during the New York National Technical Conference for a discussion of the Society's participation in the Jubilee celebration.

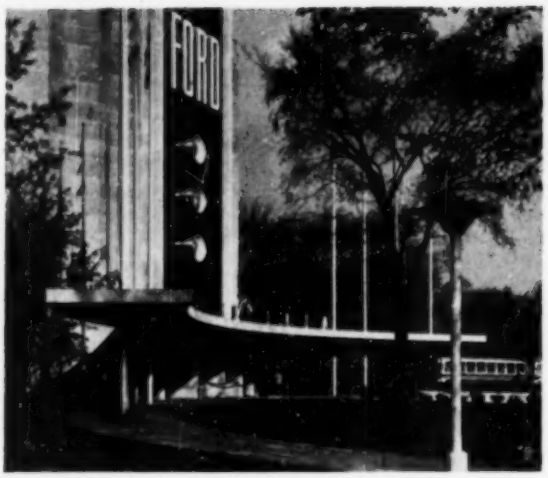
Searchlight

J. A. Bartelt, Chairman

This committee was organized at the suggestion of the Defense Coordinating Committee and began its study of the design and application of searchlights particularly in relation to military and civil defense needs.

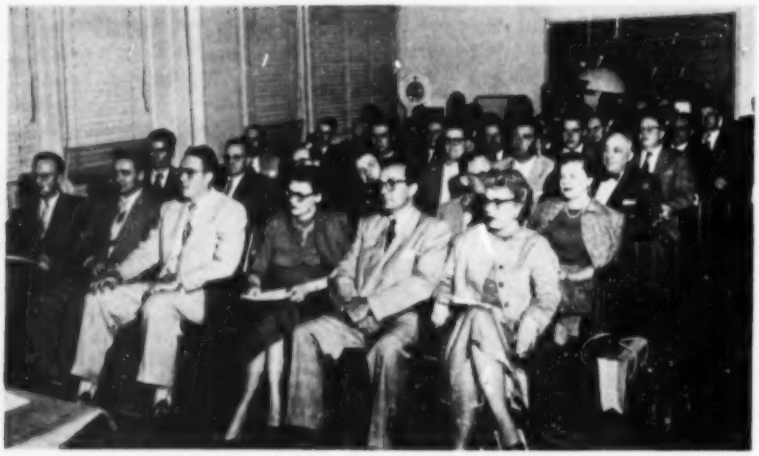
Here and There with I.E.S. Members

San Diego Chapter's gavel, a gift from the Alabama Chapter of I.E.S., is presented to Chairman C. M. Thompson by the Chairman of the "parent" Southern California Section, D. W. Prideaux. See page 13A for story of Charter Meeting.



A total of 140 members and guests of the Michigan Section toured the Ford Rotunda and the Final Assembly Plant at their October 13 meeting. Introductions of new officers and a resume of the New York Conference were also features of the program.

A record enrollment of 57 students attended the course in Fundamentals of Illumination sponsored by the New York Section. The 12-week course began September 21. *Photo by Consolidated Edison.*



"Operation I.E.S.," an orientation session for officers and committee chairmen was held by the Chicago Section October 9. About 60 Section and Chapter officers in the Midwestern Region and Chicago Section Committee chairmen attended the all-day indoctrination session.

TELECAST

LIGHTING NEWS OF CURRENT INTEREST

Summary of Action Taken at New York Council Meeting

The Society's new President, A. H. Manwaring, presided at the first Council Meeting of his administration October 8, in New York City. Present also were: Past Presidents S. G. Hibben and E. M. Strong; Vice-Presidents R. F. Hartenstein and D. M. Jones; General Secretary M. N. Waterman; Treasurer K. M. Reid; Directors: G. W. Beals, J. S. Schuchert, C. C. Shotwell, W. A. Stannard, J. F. Whitehead, Jr., F. C. Winkler; Regional Vice-Presidents: C. J. Berry, Glenn E. Park, C. B. Pederson, G. J. Taylor, L. C. Twichell, S. B. Williams proxy for M. B. Hastings, C. C. Keller proxy for W. J. Lind, Myrtle Fahsbender proxy for M. J. Myers, Jr.; Executive Secretary A. D. Hinckley; Technical Director C. L. Crouch; Editor Ruby Redford; Advertising and Promotion Manager C. E. Ellis; and J. Roy Jones, T. W. Lauer and W. P. Lowell, Jr.

In addition to regular Society business, Council took action on the following matters:

Membership

On recommendation of the General Board of Examiners, Council unanimously approved the election of Lester H. Graves to the grade of Member Emeritus. Mr. Graves, already a Fellow of I.E.S., and its President in 1939-1940, retired from active business recently, following many years with Curtis Lighting, Inc. and forty years of distinguished service to I.E.S.

The Board's report also recommended the election and transfer of 34 Members, and reported their election of 113 Associate Members and 3 Students. Following Council's favorable action on the report, current membership statistics were as follows:

September 30, 1953		October 8, 1953
7795	Total Membership	7922
32	Members Emeritus	30*
70	Fellows	70
1870	Members	1899
5579	Associate Members	5682
244	Student Members	241

*Includes 11 Fellows.

T. W. Lauer, Membership Chairman, gave an outline of his committee's proposed program for 1953-1954. This included, among other plans, a national contest similar to last year's, based on competition between Sections and Chapters of comparable size, in four groups. First prize in each group will be $30.00, second in each group $20.00.

Committee Appointments

Council reviewed and approved a list of several hundred new committee appointments for 1953-1954 and several new committees. Complete committee personnel appointed to date is given in the back pages of this issue, and will be brought up to date in a late winter issue.

M.M.I.L.J.

As part of discussion and action on the report of the Finance Committee, Council approved the proposal that a prize allowance of $25.00 be available to each Section and Chapter holding a contest in the competition for "My Most Interesting Lighting Job." A total of 40 local contests are anticipated this year.

Regional Activities

R. F. Hartenstein, Chairman of the Regional Activities Committee, reported on a meeting of five Regional V-Ps held October 7, at which a number of important local activities were discussed. Some of these included Section and Chapter budgets, representatives on national committees, procedure of the Board of Fellows, Regional Conferences and Local Representatives.

Committee Reports

Four technical committee reports, previously reviewed by Council, were approved. These were:

"Lighting for Burling and Sewing (Mending)," a report prepared by the subcommittee on Lighting in the Textile Industry, A. A. Brainerd, Chairman.

"Lighting in Saw Mills — Redwood Green Chain, Part I," by the industry subcommittee, also under Mr. Brainerd's chairmanship.

"Calculating Coefficients of Utilization" prepared by the Committee on Lighting Design Practice, J. R. Jones, Chairman.

"Residence Lighting Resource List," a report of the Residence Lighting Committee, Mary Webber, Chairman.

New Sustaining Members

C. C. Shotwell, Chairman, recommended the election of two new Sustaining Members as follows, both from Canada.

The Holophane Company, Limited
150 The Queensway
Toronto 14, Ont., Canada.
Official Representative: Frank T. Groome

Sylvania Electric (Canada) Ltd.
605 University Tower Building
Montreal, P. Q., Canada.
Official Representative: John J. Kavanagh

Mr. Shotwell also outlined a well-organized program planned for his committee's work this year, including information brochures, and campaign quota.

Technical Committee Chairmen Hold Two-Day Conference

A preview of things to come, and a mutual look at I.E.S. committee problems was given to technical committee chairmen at the two-day forum held November 12 and 13 in Philadelphia. This exchange of views and current reports, now an annual meeting of major importance, has proved of incalculable value to technical committees. Some 30 technical committees were represented at the Forum, as well as an additional 30 subcommittees. Chairman of the meeting was Duncan M. Jones, Senior Vice-President of I.E.S. Philadelphia Electric Company kindly furnished the hall.

The meeting opened with a preliminary program featuring talks as follows:

"Why a Forum"—Duncan M. Jones, Chairman

"A Forward Look at 1953-1954"—President A. H. Manwaring

"Hindsight for Foresight"—Past-President E. M. Strong

"The Story to Our Public"—Ruby Redford, Editor of I.E.

"Tools for Our Use"—C. L. Crouch, Technical Director

"Highway Safety—Research Must Answer"—Dr. T. W. Forbes, Technical Director of the National Research Council Committee on Highway Safety

Some highly interesting developments were revealed by many of the committee

chairmen reporting at the following sessions. Complete minutes of these sessions will include reports of:

Aviation Lighting Committee—D. C. Miller
Civilian Defense—J. C. Forbes
Color and Illumination—R. C. Allison
Daylighting—R. W. McKinley
I.E.S.-ASHVE—Walter Sturrock
I.E.S.-USPHS—J. F. Parsons
Illumination Performance Recommendations—Ben Benson
Industrial Lighting—J. R. Chambers
Subcommittee on Canning Industry—C. O. Martin
Clothing Industry—Norman Kridel
Printing Industry—Ralph Enghouser
Sawmill Industry—L. G. Parks
Institutional Lighting—James H. McCulloch
Light Control & Equipment Design—David L. Williams
Light Sources—Henley Davidson
Lighting Design Practice—Roy Jones
Lighting Education—H. H. Magdsick
Lighting Maintenance—Richard Townsend
Nomenclature—D. M. Finch
Office Lighting—J. J. Neidhart
Progress—E. W. Beggs
Public Conveyances—Carl Egeler
Research Planning—Willard Allphin
Residence Lighting—Norman Vacha
School Lighting—J. M. Chorlton
Searchlights—T. O. Projector
Signal Lighting—F. C. Breckenridge
Sports & Recreational Lighting—Merle E. Keck
S.Q.Q.—S. K. Guth
Store Lighting—R. C. Allison
Street and Highway Lighting—Charles H. Rex
Visibility under Fog Conditions—Ellis E. Paul
Testing Procedures—Kurt Franck
Television Production—R. L. Zahour

Research and Development Stressed at Aviation Lighting Conference

"How to get the most from your research and development dollar" was the subject of a discussion panel of aviation lighting experts which highlighted the Fall Technical Conference of the I.E.S. Committee on Aviation Lighting. The conference was held in Washington, D.C., October 13-14, at the National Bureau of Standards.

The Research and Development symposium, was a joint session with the National Electrical Manufacturers Associations Aviation Ground Lighting Section, and included speakers from both N.E.M.A. and I.E.S. membership. In the opinion of Dr. R. H. Blackwell, University of Michigan, pure research should be sponsored only by the National Science Foundation. It is a mistake for the Defense Dept. to sponsor pure research although it sometimes does, he stated. The I.E.S. should not support development research in which specific equipment to do a specific job is involved, he said.

Competition is the fairest means for deciding who does what in research and development, in the opinion of F. C. Breckenridge, U. S. Bureau of Standards. He demonstrated a table which indicated the type of organization which he believed would logically perform the various phases of it.

One of the most difficult problems which the government faces is that of adequate investigation of a problem, said W. C. Fisher, Navy Bureau of Aeronautics. All too frequently, the activity which has the problem will follow only one line in attacking the problem, instead of following more than one line of attack at the beginning, he stated.

G. M. Kevern, U.S.A.F. Air Materiel Command, described the U.S.A.F. development program. He said that the 1954 lighting work will be concerned with changes in runway lighting required by jet operations, taxiway reflectors and lights, cable fault locators, and continuation of the runway lighting configuration tests at Indianapolis.

In the opinion of J. B. Rhodes, vice president of the A.G.A. Division of Elastic Stop Nut Corp., an established market does not exist for new aviation ground lighting devices. He said that there are very few pressing needs to stimulate the interest of the Aviation Ground Lighting Industry in research. A way must be found, he said, to enforce standardization of commercial aviation ground lighting equipment when such enforcement otherwise will lapse because of the abandonment of the Federal-Aid to Airports Program.

The I.E.S. Research Fund does not define differences between pure and basic research, stated C. L. Crouch, I.E.S. Technical Director. It is intended to provide work on fundamental problems or test methods. He said that not enough basic research causes interruptions and stoppages when production starts too soon.

H. J. C. Pearson, C.A.A., said that sometimes competitive bidding on research projects is practical and it is sometimes necessary to sell a job to a prospective contractor.

Planes must be better lighted as a safeguard against collisions, said Joseph D. Blatt, Assistant Administrator of the Civil Aeronautics Administration. Within five years, we are likely to see planes cruising at 500 mph speeds, which means they will be closing on each other at 1000 mph, he added. Blatt listed ten key problems in aviation lighting today as: (1) Effective means for collision avoidance — better external lighting and improved cockpit vision ;(2) Collision hazard of clear bright daylight conditions; (3) Basic physiological and psychological data needed; (4) Special lighting for special types of aircraft;

SPEAKERS AND CHAIRMAN examine sample of integral lighting for aircraft instruments demonstrated by J. H. Achilich, Office of Naval Research, Special Devices Center. Left to right are: H. A. Cramer, Glenn L. Martin Co. Capt. R. A. Stone, United Airlines; W. C. Fisher, Navy Bureau of Aeronautics; J. H. Achilich; P. H. Greenlee, Grimes Mfg. Co.; and D. C. Miller, General Electric Co., committee chairman.

(5) Superhigh intensity lighting for 2000-ft television towers; (6) Improved runway guidance lighting through intersections; (7) Distinctive lighting for far end runway zones; (8) Threshold lights must be made proof against jet blasts; (9) Special approach and landing area lighting for helicopters; (10) Aircraft proximity indicator urgently needed to warn pilots where to look for lights of approaching aircraft.

P. H. Greenlee, Grimes Mfg. Co., presented a progress report on Grimes' development program on helicopter landing lights with a statement covering the peculiarities of helicopters which require lights somewhat different than those used on conventional airplanes. More extensive flight tests will be made to determine the most desirable features suggested by manufacturers and operators.

The Navy BuAer development project on helicopter rotor tip lights was described by W. C. Fisher, Navy Bureau of Aeronautics, and G. I. Hackenberger, Jr., Kaman Aircraft Corp. Major problem is to design fixtures which can be utilized on any helicopter and which do not detract from blade performance. Favorable pilot reaction has been received for a system of formation lights consisting of red and green lights operated by sliprings and commutator on main rotor shaft.

J. H. Achilich, Office of Naval Research, Special Devices Center, described a system of instrument lighting devised by his Center in which the lamp is mounted in the center of the instrument cover glass. Power is brought to the lamp by a transparent coating on either side of the glass, he said.

According to Captain R. A. Stone, United Airlines, there is a growing need for better aircraft lights as more and more airplanes are flying at faster and faster speeds. The planes must be made more conspicuous and it must be possible for the pilot to determine immediately what the other airplane is doing as soon as he sees it, he said. Some of the improvements he suggested were: better "ice lights"; engine nacelle lights; servicing lights; wheel and tire lights; landing lights, extendable at high speeds, that do not blind the pilots; taxiing lights and anti-collision lights to make planes more conspicuous.

Instrument runways should be equipped with approach lighting systems at both ends, in the opinion of Capt. R. C. Robson, American Airlines. This will enable pilots to make "straight in" landings most of the time, he said. Approach lights should, wherever possible, extend to 4500 ft or more beyond the runway ends, he stated. Airport signs, in his opinion, must be high enough to be in

LIGHTING CALENDAR

Society Events

February 11, 1954—Meeting of I.E.S. Council, New York, N. Y.

April 8-9, 1954—Southern Regional Conference, Roosevelt Hotel, New Orleans, La.

April 11-13, 1954 — Southwestern Regional Conference, Rice Hotel, Houston, Texas.

April 15-16, 1954—Inter-Mountain Regional Conference, Denver, Colo.

April 19-20, 1954—South Pacific Coast Regional Conference, Museum of Art, San Francisco, Calif.

April 22-23, 1954 — Pacific Northwest Regional Conference, Benjamin Franklin Hotel, Seattle, Wash.

April 28-30, 1954—Canadian Regional Conference, King Edward Hotel, Toronto, Ont.

May 3-4, 1954 — Great Lakes Regional Conference, Sheraton-Cadillac Hotel, Detroit, Mich.

May 17, 1954 (Week of, one day)—Northeastern Regional Conference, Hartford, Conn.

June 17-19, 1954—Midwestern Regional Conference, Jefferson Hotel, St. Louis, Mo.

September 12-16, 1954—Illuminating Engineering Society, National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

Industry Events

January 11-14, 1954—National Rural Electric Cooperative Association, National Convention, Miami, Fla.

January 18-22, 1954—American Institute of Electrical Engineers, Winter General Meeting, New York, N. Y.

January 25-28, 1954—Plant Maintenance & Engineering Show, International Amphitheatre, Chicago, Ill.

March 8-11, 1954—National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

May 3-7, 1954 — Society of Motion Picture and Television Engineers, Semi-Annual Convention, Hotel Statler, Washington, D. C.

May 13-14, 1954 — Public Utilities Advertising Association, National Convention, Hotel Statler, Boston, Mass.

June 6-11, 1954 — National Association of Electrical Distributors, 46th Annual Convention, Atlantic City, N. J.

June 21-25, 1954 — American Institute of Electrical Engineers, Summer General Meeting, Los Angeles, Calif.

September 22-24, 1954—Canadian Electrical Manufacturers Association, General Brock Hotel, Niagara Falls, Ont., Canada.

October 11-15, 1954 — American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

October 18-22, 1954—42nd National Safety Congress & Exposition of the National Safety Council, Chicago, Ill.

October 18-22, 1954—Society of Motion Picture and Television Engineers, Semi-annual Convention, Los Angeles Ambassador, Los Angeles, Calif.

November 8-11, 1954 — National Electrical Manufacturers Association, Haddon Hall Hotel, Atlantic City, N. J.

November 28 - December 3, 1954 — The American Society of Mechanical Engineers, Annual Meeting, Statler Hotel, New York, N. Y.

Photos courtesy of R. C. Blatt, Electrical World

COMMITTEE CHAIRMAN D. C. Miller; Joseph Blatt, and H. J. Cory Pearson of C.A.A.; and Charles Adler, Jr. Mr. Adler was presented with a citation award for outstanding contributions to the development of air safety. He has made a number of important inventions and developments in aircraft lighting.

plain view of the pilot — perhaps 6 ft high and runway lights should be brighter, more numerous and not too sharply focused. There must be an unmistakable indication of intersections so that pilots will know where to turn off runways, more and brighter blue taxi lights and a painted yellow center line stripe on taxiways, he stated.

J. F. Angier, of C.A.A., presented a discussion with slides showing the latest status and developments in approach lighting. He said that the International System is based on the center line and cross bar system. There are three different National standards, he stated.

The Milwaukee Runway Lighting Project (a C.A.A. evaluation of the runway marker light having the theoretical distribution as calculated by C.A.A.) was discussed by H. J. C. Pearson. These lights were developed by Line Material.

H. N. McIntyre, General Electric, presented a progress report covering work done by his subcommittee on apron and ramp floodlighting. An abstract of the Aircraft Lighting Guide Report was given by H. A. Cramer, Glenn L. Martin Co., chairman of the Aircraft Lighting Subcommittee, which is completing the Guide Report. A description of the installation of taxiway lights and directional signs recently installed at the Port of New York Authority airports was presented by Victor Converso, Port of N. Y. Authority.

Pocket-Size Folder Outlines I.E.S.

Information on the I.E.S. and its services is outlined in a handy pocket-size folder available from the Society Headquarters Office. The folder gives information on membership grades and qualifications, the Society organization, and I.E.S. activities on the national and local level. Copies are available from A. D. Hinckley, I.E.S. General Office.

I.E.S. President A. H. Manwaring (right) is made an honorary detective of Atlantic City, by Mayor Richard Altman, as part of the welcome extended by the city to the 1954 I.E.S. National Technical Conference next September 12-16.

Atlantic City Welcomes I.E.S. 1954 Convention

Mayor Richard Altman of Atlantic City, N. J. has officially turned over the city to the I.E.S. for its National Technical Conference in 1954. A highlight of the ceremony, November 9, was the appointment of I.E.S. President A. Homer Manwaring as an honorary detective. Executive Chairman of the Conference A. S. Turner, Jr., was present as witness.

Particular attention was called to the charms of this seaside resort in the month of September, and the variety of entertainment available—from the boardwalk, sports, and nightclubs to the celebrations of Light's Diamond Jubilee and the 100th anniversary of the founding of Atlantic City.

School Lighting Research Underway at U. of California

The first of several projected basic researches on school environment has been accepted by the University of California, Berkeley, Calif. The projects are sponsored by the Pacific Coast Electrical Association under a research grant, and are aimed to provide basic data on lighting, acoustics, heat transmission of walls and ceilings, etc., brightness controls and daylighting and a number of other environmental factors in school building.

The first project, by the School of Education at U.C., is to be an exploratory survey and evaluation of material already published or available. Other projects may go to the Schools of Engineering, Ophthalmology, Psychology, Health, as indicated by the nature of the project when determined.

Chairman of the PCEA research committee, which acts as liaison between Boards of Regents and the Association, is Ralph J. Crump, University of California, Los Angeles. Vice-Chairman is James E. Barnes, illuminating engineer, Pacific Gas & Electric Co., San Rafael, Calif. Membership of their committee represents both northern and southern California, with architects, engineers and school officials comprising the personnel.

Industrial Council Held For High School Teachers

Nearly 1,000 industrialists and educators took part in the third Industrial Council at Rensselaer Polytechnic Institute, Troy, N. Y., on October 30 and 31. At the meeting, 150 top executives in the electrical-electronics manufacturing industry met in forum sessions with 600 high school social studies teachers, writers and public opinion experts from across the nation, and discussed the industry's major contributions to modern life and the free world's defense.

The purpose of the Industrial Council is to promote better understanding of industry's role i nthe world today. Endorsed by the National Electrical Manufacturers Association and the Radio-Television Manufacturers Association, it is sponsored by companies in the industry and organized by Rensselaer Polytechnic Institute.

Four nationally-known industry leaders made major addresses. The Friday luncheon speaker was Don G. Mitchell, chairman of the board, Sylvania Electric Products, Inc., with the subject, "The Electrical-Electronics Manufacturing In-

(*Continued on page* 13A)

Next Year's Conference Paper Outlines Due January 15

If you plan to present a paper at the 1954 National Technical Conference in Atlantic City, NOW is the time to prepare your outline. All outlines for 1954 Conference papers must be in the hands of the Papers Committee no later than January 15, 1954. Send them to: Dr. R. M. Zabel

Papers Committee Chairman
Westinghouse Electric Corp.
Bloomfield, New Jersey.

plan for

Controlled Light

with the

powerstat

Wallbox Dimmer

- Any amount of light from darkness to full brightness
- Installed as easily as the ordinary wallswitch
- Economical, cool, silent operation
- Approved by the Underwriters' Laboratories

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT

The modern era of home lighting is at your fingertips. Gone is the "on-off" lighting of the ordinary wallswitch. A new concept in light control, the **powerstat** Wallbox Dimmer, replaces the wallswitch to permit the control of light from complete darkness to full brightness. Simply turning a knob brightens or softens light silently and smoothly — selects the amount of light just right for any occasion or activity — for the reflection of every mood — the ideal brightness for every seeing task.

Here is home lighting for better living — CONTROLLED LIGHT.

Complete information about Controlled Light is available in Bulletin D653WBT. And for your customers, a simple, non-technical Bulletin D253WBC.

Write to:

THE SUPERIOR ELECTRIC CO.
5123 Demers Avenue, Bristol, Conn.

NAME _____

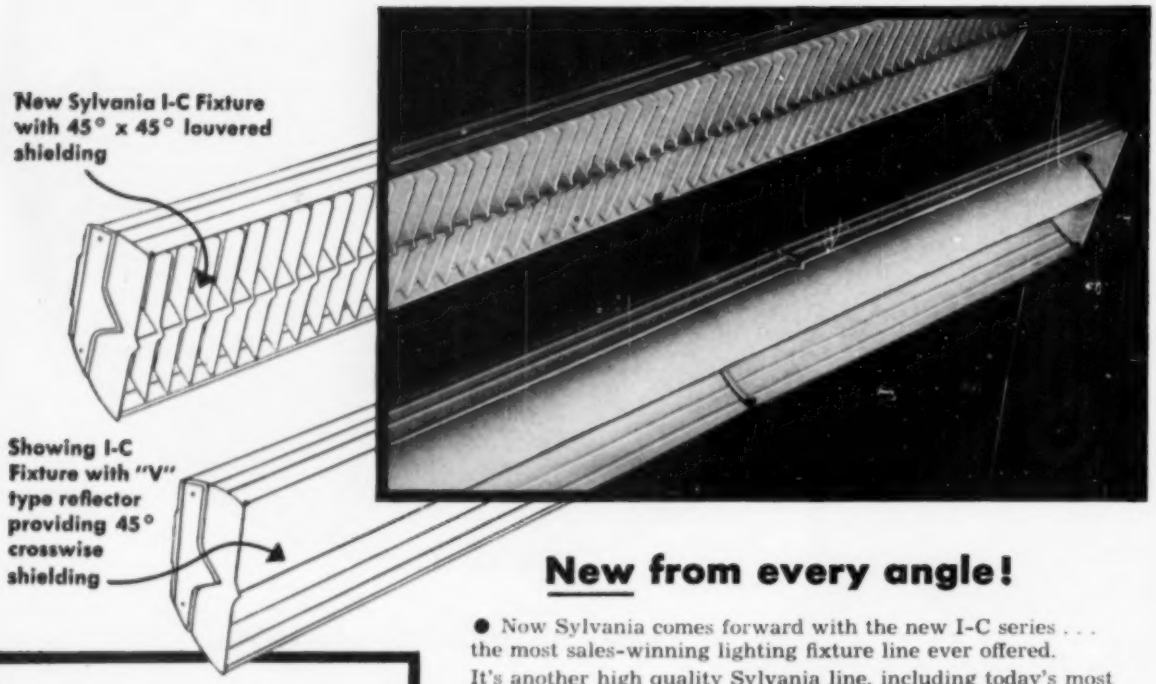
POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ***ZONE*** _____ ***STATE*** _____

Sylvania Announces! A New Industrial-Commercial Fluorescent Fixture Line!


New Sylvania I-C Fixture with 45° x 45° louvered shielding
Showing I-C Fixture with "V" type reflector providing 45° crosswise shielding

New from every angle!

● Now Sylvania comes forward with the new I-C series . . . the most sales-winning lighting fixture line ever offered. It's another high quality Sylvania line, including today's most wanted features. Amazingly versatile, too, with 4, 5, and 8 foot units specifically designed to meet the lighting needs of offices, stores, schools and factories. Ideal for critical seeing tasks such as those encountered at printing plant composing stones or in the machining of specular metals.

And, it's a right-priced line offering new business opportunities to your architect, builder, and electrical-contractor friends . . . for both *industrial and commercial applications.*

Remember, this Sylvania I-C line is designed, built and tested and *fully guaranteed* for one year by Sylvania. For detailed information see your Sylvania representative or write directly to: Sylvania Electric Products Inc., Dept. 3X-3012, 1740 Broadway, New York 19, N. Y.

Quality built and packed with these advanced features:

45° x 45° Louvered Shielding—Direct Glare is kept to a minimum when 45° x 45° louver shielding is used.

60%-40% Distribution — Distribution from I-C fixtures is 60% downward and 40% upward, providing a strong direct component for high levels of illumination.

Versatile and rugged, too! — Channels are die-formed of 20-gauge steel. Made with extra knockouts to provide flexibility of installation. Designed for individual or continuous-row installations, pendant or surface mounting. Metal parts Bonderite treated to resist deterioration. Channels, louvers and steel panels finished in Sylvania's high-temperature baked Miracoat, providing 86% reflectivity.

T-17 Low Brightness Unit — The I-C line has been designed to accommodate the 40-watt 60-inch T-17 low-brightness lamp, meeting the need for a unit with minimum shielding. Combines low brightness, comfortable illumination with high efficiency and easy maintenance.

SYLVANIA

LIGHTING · RADIO · ELECTRONICS · TELEVISION

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

(Continued from page 10A)

dustry — How It Began." Allen B. DuMont, president of Allen B. DuMont Laboratories, Inc., spoke that evening on how the industry operates. Andrew W. Robertson, chairman of the finance committee and formerly chairman of the board of Westinghouse Electrical Corp., addressed the Saturday luncheon meeting on the subject, "The Electrical-Electronics Manufacturing Industry — What It Does." Ralph C. Cordiner, president of the General Electric Co., predicted the future of the industry at the closing session on Saturday evening.

Chairmen of the four major sessions were: William A. Roberts, president, Allis-Chalmers Manufacturing Co.; Lyle G. Hall, president, Stackpole Carbon Co.; Adger H. Johnson, president, National Carbon Co.; Glen McDaniel, president, Radio-Electronics-Television Manufacturing Association; and Robert C. Sprague, chairman of the board, Sprague Electric Co. Mr. Paxton was chairman of the program committee.

Those attending the Industrial Council participated in 18 separate panel conferences with detailed, informal discussions of how the electrical-electronics manufacturing industry began, how it operates and what it does. Executives and scientists from the industry served as moderators and members of the panels, with an outstanding educator representing the teachers on each panel.

San Diego Chapter Starts Year With Charter Meeting

The San Diego Chapter of I.E.S. began the fiscal year October 1 with the presentation of its Charter and official gavel. Regional Vice-President (South Pacific Coast Region) L. A. Hobbs presented the Charter to Chapter Chairman C. M. Thompson; and D. W. Prideaux, Chairman of the "parent" Southern California Section, handed over the gavel, the gift of the Alabama Chapter. The attendance of 80 included 12 members of the Southern California group, who came to inaugurate the new Chapter.

The meeting was opened by Chairman Thompson and was presided over by V-P Hobbs. William P. Bear, Member Emeritus of the Society, installed the Chapter's officers.

Other highlights of the meeting were speeches by H. G. Dillin, San Diego Gas & Electric, on "The Growth of Lighting," and by Roy E. Dahlin, Southern California Edison Co., on the New York Technical Conference. The meeting closed with an inspirational talk by Past Regional Vice-President T. H. Shepherd.

I.E.S. Regional Conferences, 1954

Southern	Roosevelt Hotel New Orleans	April 8-9
Southwestern	Rice Hotel Houston	April 11-13
Inter-Mountain	Denver	April 15-16
South Pacific Coast	Museum of Art San Francisco	April 19-20
Pacific Northwest	Benjamin Franklin Hotel Seattle	April 22-23
Canadian	King Edward Hotel Toronto	April 28-30
Great Lakes	Sheraton-Cadillac Hotel Detroit	May 3-4
Northeastern	Hartford	Week of May 17 (one day)
Midwestern	Jefferson Hotel St. Louis	June 17-19

"Pay-As-You-Go" Rewiring Now Available for Homes

An experiment in home wiring, aimed at solving the problem of inadequate wiring in existing homes, is underway in Cincinnati, *Electrical Wholesaling* magazine reports.

A time-payment plan will attempt to make the needed renovation process as painless as possible by allowing costs for up-to-date wiring to be underwritten by local electric utility companies and then paid on the installment plan with the monthly payments added to the regular electric bill.

It is designed to help families who, for example, want all-electric kitchens and find, after buying clothes washer and dryer, dishwasher, disposal and other appliances, that the home's wiring capacity will not stand the extra load.

The plan is available to any residential or farm customer now occupying wired premises served with electricity by the Cincinnati Gas & Electric Company or the Union Light, Heat and Power Company. The wiring covered by the plan may consist of any and all wiring changes (including lighting units) from the end of the power company's facilities to the point of appliance connection.

Maximum period over which the cost may be spread is three years, and the minimum monthly payment is two dollars.

SAN DIEGO Chapter Chairman C. M. Thompson (right) receives the Chapter's Charter from Regional V-P L. A. Hobbs, October 1.

McGraw Award Medals Recently Presented

The Manufacturer's Medal, the Contractor's Medal and the Medal for Cooperation of the James H. McGraw Awards for Electrical Men were recently presented to three leaders in the electrical field.

Harry A. Winne, vice-president, General Electric Co., received the Manufacturer's Medal at a luncheon meeting of the National Electrical Manufacturers Association on November 11. The citation reads "in recognition of his out-

(Continued on page 14A)

AVERAGE ATTENDANCE was 75 at the Lighting Training Meetings for Atlanta wholesalers, sponsored by the Georgia Section, I.E.S.

(Continued from page 13A)

standing industrial statesmanship contributing to the advancement of the electrical manufacturing industry in the fields of engineering and nuclear research."

Bonnell W. Clark, former Westinghouse vice president who headed the Electrical Equipment section of the National Production Authority, received the Medal for Cooperation at the same meeting, "in recognition of his outstanding accomplishments in the great task of mobilizing the resources of the electrical industry to the service of the nation."

The Contractor's Medal was presented to Erne C. Carlson, president of the Carlson Electric Co., Youngstown, Ohio, at the banquet of the National Electrical Contractors Association in Miami Beach, on November 19. Mr. Carlson received the award for "his enlightened leadership and devotion to the advancement of constructive labor-management relations in the electrical contracting industry."

Plant Maintenance Show To Be Held on West Coast

Plans for the West Coast's first Plant Maintenance Show are underway, with a board of leading western industrialists as sponsors. The show is scheduled for the Pan Pacific Auditorium in Los Angeles, July 13 to 15, 1954. It will be held concurrently with a Plant Maintenance Conference, directed by L. C. Morrow, consulting editor of *Factory Management and Maintenance* magazine.

Atlanta Wholesalers Take Illumination Course

A series of Lighting Training Meetings for electrical wholesalers in Atlanta was sponsored by the Georgia Section of I.E.S., under the direction of Harry Yopp, Chairman of the Section's Education Committee. Ten sessions were held, two each week beginning October 13, at the Peacock Alley in Atlanta. The speakers were members of the Georgia Section and average attendance at the sessions was 75 wholesalers.

The success of this course is such that similar ones are being planned for electrical contractors and manufacturers' representatives.

Back Issues of I.E.S. Transactions Needed

The assistance of I.E.S. members has been asked in filling a few gaps in the complete library of the "Transactions of the I.E.S." and ILLUMINATING ENGINEERING of the late George G. Cousins. This library was, at his wish, presented to the Engineering Library of Queen's University in Kingston, Ont.

Five issues are missing from the collection:

July 1920 (Vol. XV, No. 7)
July 1923 (Vol. XVIII, No. 7
May 1930 (Vol. XXV, No. 5)
December 1934 (Vol. XXIX, No. 10)
June 1936 (Vol. XXI, No. 6)

Anyone who can donate these copies to complete the collection should write to Mr. Frank Reed, % John C. Virden, Ltd., 19 Curity Avenue, Toronto, Ont., or to Professor H. S. Pollock, Queen's University, Kingston, Ont.

Regional Conference Takes on New Look

The Northern California Section, host to the South Pacific Coast Regional Conference this year, is planning something new for next April 19-20. This conference will be beamed directly at architects, interior decorators and designers, and will be held at the San Francisco Museum of Art.

A five-week exhibit on Light, Color and Decoration to be sponsored jointly by the Museum and the I.E.S. Section, will run concurrently with the Conference and will include participation by leading interior decorators.

Cold Cathode Lighting Forum Held in New York

The Fluorescent Lighting Association sponsored a forum on "Cold Cathode Lighting" November 2, in New York City. The program included:

Cold Cathode's Part in Lighting—V. H. Todd.
The Cold Cathode Lamp—Miles Pennybacker.
Application of Cold Cathode—A. Byer.
Cold Cathode Lighting Data — B. F. Greene.

A question and answer period was held at the end of the program.

Six-Week Illumination Course Sponsored by Oregon Section

An educational and refresher course, "Illumination . . . Fundamentals and Application," was sponsored by the Study Club Committee of the I.E.S. Oregon Section, beginning November 2, with classes weekly through December 7. Topics and speakers for the six sessions were:

November 2

Light and Vision — Dr. Raymond R. Roy, Optometrist.
Illumination Terminology—Frank Reis, Pacific Power & Light Co.
Quantity and Quality Requirements for Good Illumination — Robert E. Lange, Eoff Electric Co.

November 9

Light Sources — Walter E. Potter, General Electric Co.
Color Harmony in Lighting Application — Thayne J. Logan, A.I.A., Architect.

November 16

Illumination Design — D. E. Seely, Westinghouse Electric Corp.
Industrial Lighting—Coe C. White, Jr., Myers and White.

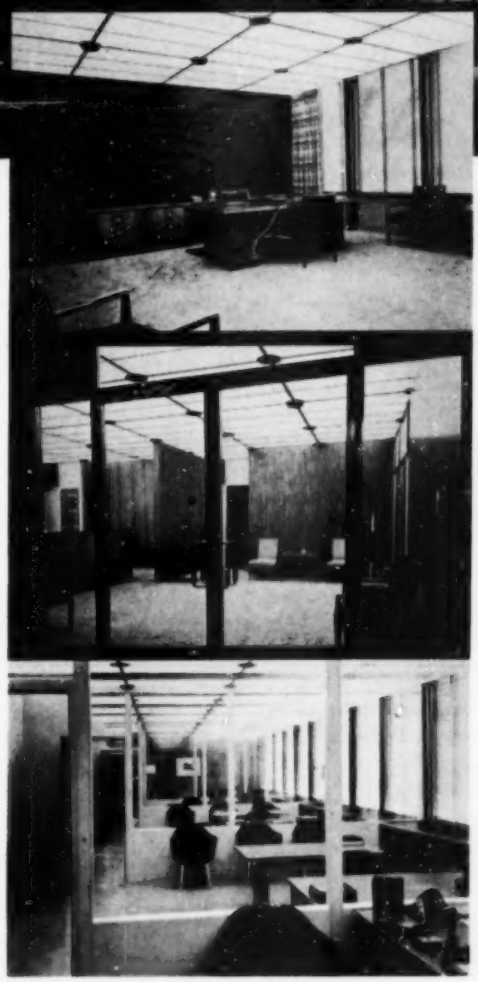
November 23

School Lighting — Del Maulding, Portland General Electric Co.
Daylighting— Allen E. Baker, Kimble Glass Co.

(Continued on page 16A)

For Luminous Ceilings at Their Best—

PLEXIGLAS



Architects: Saarinen-Saarinen & Associates.

Luminous ceilings with diffusing panels of PLEXIGLAS® provide highest quality lighting and clean, fixture-free appearance in offices, lobbies and corridors of this Engineering Staff building of a major motor car manufacturer. In addition, they conceal air ducts, and water pipes for sprinkler heads located inconspicuously below the diffusers.

Luminous ceilings are at their best in function and appearance when the all-important diffusers are PLEXIGLAS, because this Rohm & Haas Company acrylic plastic:

. . . *provides efficient, uniform diffusion of light.*

. . . *resists discoloration and breakage.*

. . . *is strong, light in weight, and dimensionally stable.*

. . . *can be formed at low cost to custom shapes.*

. . .

We will be glad to send you literature on the use of PLEXIGLAS for luminous ceilings and large-area fixtures.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*

PLEXIGLAS is listed in Sweet's Architectural File, Section 6d/Ro.

(*Continued from page* 14A)

November 30

Office Lighting—Theron W. Fritch, Portland General Electric Co.
Store Lighting — Ray M. Camnitz, Day-Brite Lighting, Inc.

December 7

Home Lighting—Grace Schoeni, Portland General Electric Co.
Special Lighting — Donald H. Anderson, General Electric Co.
Cost and Maintenance of Lighting — Wesley R. Grasle, W. R. Grasle Co.

The classes were held in the Conference Room of the Public Service Building, Portland. Registration was limited to 40.

OBITUARIES

S. R. Williams

Stuart R. Williams, Vice-President in charge of Manufacturing and a Director of Holophane Company, Inc., died November 3, at the age of 50, at Newark, Ohio following an operation.

An outstanding authority in the field of street lighting, Mr. Williams served the Society for many years on the I.E.S. Committee on Street and Highway Lighting, where his leadership and earnest effectiveness toward progress in street lighting were complemented by his friendly and active sense of humor.

Mr. Williams, who joined the Society in 1925, began his career as Lighting Specialist with Westinghouse Electric Corporation. In 1929 he joined the Holophane Company as Street Lighting Engineer, becoming manager of the Street Lighting Department in 1936, Assistant Works Manager in 1941 and Vice-President in charge of Street Lighting in 1948. A contributor of many articles on Safety Lighting, Mr. Williams was a member of the National Society of Professional Engineers and a Past President of the Central Ohio Society of Professional Engineers.

Joseph F. Scherieble, member of the Twin City Section of the Society since 1946, passed away October 9 after a long illness. Mr. Scherieble had been associated with the Northern States Power Company since 1930. Except for the war years, he was with their Lighting Sales Section and became Supervisor of Adequate Wiring of the Section in 1945.

ABOUT PEOPLE

By action of Council on October 8, **Lester H. Graves,** a Fellow and Past President of I.E.S., who recently retired from Curtis Lighting, Inc., was elected to the grade of Member Emeritus of the Society. His election to this grade represents the honor and recognition of the Society for his forty years of distinguished service to I.E.S.

Charles E. Wilson, former president of General Electric, has been named chairman of the Sponsoring Committee for Light's Diamond Jubilee. This committee, to be composed of a group of outstanding industrialists, will take the leadership in the nationwide celebration next year of the 75th anniversary of Edison's invention of the first practical incandescent lamp. Two committees of the Jubilee organization are already at work on plans for the 75th anniversary. These are the Jubilee executive committee, headed by **D. C. Luce,** vice-president of Public Service Electric & Gas Co., Newark, and the Jubilee program committee, headed by **Ralph P. Wagner,** of Niagara Mohawk Power Corp., Albany.

The Rohm & Haas Company has announced the election of **Dr. F. Otto Haas** as Executive Vice-President of the company. For the past two years Dr. Haas' major activities have been in the Chemicals and Plastics Sales division. He has been a director of the company since 1948 and in 1951 he was named a vice-president and member of the Executive Committee of the Board of Directors.

Election of **Virgil M. Graham** as a vice-president and member of the Executive Committee of the U. S. National Committee of the International Electrotechnical Commission (IEC) has been announced by the American Standards Ass'n, the American parent body. The IEC is the international standardizing organization in the electrical and electronic fields. It has done much work in the past so that electrical and electronic equipment of the various nations may be used interchangeably in all countries. Its objective is continually increased interchangeability of equipment to promote increased international trade and improved international relations.

Fred J. Vorlander announces the formation of Vorlander Lighting with headquarters at 80 Boylston St., Boston. The new organization will represent the L. J. Segil Co., Century Lighting Inc., and Safe Lighting Inc. in the New England area. In Maine, New Hampshire and Western Massachusets, Vorlander Lighting will be represented by **Leonard A. Bean,** operating from the Boston office. In Connecticut the interests of Century Lighting will be handled by **W. D. Gorman** of 133 W. Loomis Drive, West Hartford, Conn.

William H. Albers, president of Sperti-Faraday, sun lamp manufacturers, has announced the acquisition of Cooper Electric Company, Hoboken, N. J. At the same time, Mr. Albers announced the return of **Ralph Lostro,** who as Executive Vice-President, will manage the company's operation.

H. E. Mahan, manager of the General Electric Illuminating Laboratory, Lynn, Mass., and an authority on out door lighting, retired recently after more than 43 years' service with the company's Lighting and Rectifier Department. Mr Mahan had a hand in some of the world's most spectacular lighting projects: from bull fighting rings in South America to landing decks of U. S. Naval aircraft carriers. Mr. Mahan participated in lighting the Panama Pacific International Exposition in San Francisco in 1915, the Century of Progress in Chicago in 1933, and the Golden Gate International Exposition in San Francisco in 1939.

R. M. Swetland has been appointed manager of the General Electric Company's Lighting and Rectifier Department Illuminating Engineering Laboratory at Lynn, Mass.

The National Electrical Manufacturers Association has announced the appointment of **Laurance C. Messick** as director of the newly formed National Lighting Bureau, following the annual meeting of the N.E.M.A. Industrial and Commercial Lighting Equipment Section.

J. H. Jewell, vice-president, Westinghouse Electric Corp., was elected president of the National Electrical Manufacturers Association at their annual meeting November 11 in Atlantic City. Vice-Presidents elected by the delegates are **J. L. Busey,** General Electric

(*Continued on page* 19A)

DEPENDABLE BALLASTS

Start with

GOOD BALLAST DESIGN

CERTIFIED

E·T·L·

All Advance core and coil assemblies are completely enclosed in moisture resisting, dust-proof containers, die-formed or drawn from heavy gauge cold roll steel, thus affording sturdy, uniform construction. All containers are coated with a rust protecting, lasting black japan finish. Rubber covered cotton braided heat-resistant U. L. approved lead cable is firmly anchored to the coil leads. All external lead lengths are sufficient for easy installation without splices.

The capacitors used in Advance Ballasts for power factor correction and phase displacement are of highest quality construction. Rigid inspection and tests are conducted of all capacitors of prescribed ratings.

The core of Advance Ballasts is constructed of high-grade silicon steel laminations, stamped to close tolerances and annealed and treated to insure low wattage core losses. Objectional noise emanating from the laminated core and shell becomes almost non-existent by the unique Advance method of precision stacking and riveting.

The Advance forced core design makes possible the proper placement of 8 rivets at the points of magnetic stress outside the flux path, thereby providing a most efficient core and shell assembly that insures positive low noise level.

All Advance coils are precision-wound on rectangular cores of high grade varnish-impregnated paper with quality annealed copper wire. Specially designed high-production multiple coil-winding machines insure firmly wound, compact coils of identical size, shape, weight and characteristics.

To insure rapid heat conductivity and the consistency necessary to dampen vibration and noises, a compound containing a high percentage of silica is used in each Advance Fluorescent Ballast. Complete and careful filling of each unit seals out moisture and increases insulation resistance, thus insuring quiet, trouble-free operation.

The
WORLD'S LARGEST MANUFACTURER
DEVOTED *Exclusively* TO THE
PRODUCTION OF FLUORESCENT BALLASTS

ADVANCE TRANSFORMER CO.

The Best Ballast Buy

CABLE ADDRESS: ADTRANS

1122 W. CATALPA AVE., CHICAGO 40, ILL., U. S. A.

Everyone Gets a Dividend...

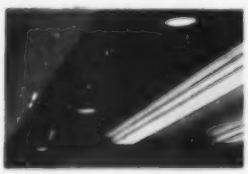
INSTALLATION: First Federal Savings & Loan Association, Lexington, Kentucky
ARCHITECT: N. Warfield Gratz, Lexington, Kentucky
ENGINEER: John V. Moore, Lexington, Kentucky
CONTRACTOR: Cutter Electric Co., Lexington, Kentucky
FIXTURES: No. 3724 2-lamp slimline 4 foot, No. 3728 2-lamp slimline eight foot, in offices, banking area.
SPACING: 7 Feet on centers
SUPPLEMENTARY LIGHTING: No. R-150 Recessed Downlites over counters, No. BFVS recessed lens boxes in corridor
INTENSITY: *Banking Area,* 30 Footcandles in Service
Office Area, 35 " " "
Counters, 25 " " "
Corridors, 15 " " "

from Lighting by LITECONTROL

EVERYONE from architect to customer gets a dividend in this bank — in comfort, convenience and cost.

The office is long and relatively narrow. But thanks to good design, and LITECONTROL, it has a bright, pleasant atmosphere. Customers like it. Tellers and officers find their work easier.

The Series 3700 "surface troffer" fixtures give everyone plenty of gentle light. Their glass side panels reduce fixture-ceiling contrast.



That inconvenient-looking air duct doesn't interfere. R-150 incandescent downlite fixtures are recessed in it right over tellers' work positions for most effective supplementary lighting.

Cleaning and maintenance couldn't be easier. Fixtures open fully at just one finger's touch on the *snap-lock* triggers. Just push easily and they lock again automatically.

Installation costs were low, because this *custom* installation was made with LITECONTROL'S *standard* fixtures. Architect and contractor worked with LITECONTROL engineers and designers.

For your lighting or relighting job, assure complete service and top quality: call your local LITECONTROL man.

Thirty *basic* fixtures — always attractive, efficient and versatile in mounting — can be combined or modified for a custom installation for you. The new catalog No. 54 gives you the whole picture. Write for it today.

LITECONTROL *Fixtures*
KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT
DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

(Continued from page 16A)

Co.; **J. W. Corey,** Reliance Electric & Engineering Co.; **W. A. Elliott,** Elliott Co.; **F. F. Loock,** Allen-Bradley Co.; **H. P. Steele,** Benjamin Electric Mfg. Co. **A. F. Metz,** the Okonite Co., was re-elected treasurer.

Don G. Mitchell, chairman of the Board of Sylvania Electric Products, Inc., has been named Commerce & Industry chairman for the 1954 campaign for members and funds of the New York Chapter, American Red Cross.

Jean H. Kempner has been named sales representative for Plastic Process Company, Inc., with his headquarters at 333 N. Michigan Avenue, Chicago.

MODERN SCHOOL LIGHTING was the subject of a symposium, held at Fresno, Calif., September 29, which featured discussion among manufacturer, utility and wholesaler lighting experts. Panel, left to right, was R. W. Thunen, Sylvania Electric Products Inc.; Marlo Denning, Incandescent Supply Co.; Larry Barre, Pacific Gas and Electric Co.; and William R. Sears, Sylvania field representative.

IT SEEMS TO ME

Some Answers to the Future Of Illuminating Engineers

I have taken seriously Professor John O. Kraehenbuehl's comments in a recent issue [I.E., September 1953, pp. 495-499] and have discussed them with several associates in the Society. As a result, I have a suggestion.

One reason why students registering in electrical engineering show a major interest in electronics is that this is a new and somewhat glamorous field with what seems to be a wonderful future. At least, it so appeals to high school science teachers, who have much influence in developing the preferences of their pupils. That the glamor may not extend to all individuals entering that field and that there still is much glamor in the power and lighting fields is likely to be missed by these teachers, to whom even all of electrical engineering is but a small part of their interest.

This can be corrected in part by education of the teachers and one way to accomplish that is by what might be called "educational library subscription" for I.E. Through this, utilities and others, perhaps at a rate of $5.00 per year or less, could place the more important high schools in their areas on such a mailing list, complimentary, directing the issues perhaps to the attention of the head of the science or physics department.

Ultimately I believe the universities themselves can and should do a much better job of "selling" their product (graduates) to industry and also of educating the high school teachers by providing lectures, etc. But the primary requirement is to create a demand in the form of interested registrants. And it seems to me and to others with whom I have talked that my suggestion points one way that this can be done. LEONARD V. JAMES, *Illuminating Engineering Consultant, LaGrange, Ill.*

Comparative Rating Guide For Fluorescent Luminaires

It seems to me that the comparative rating guide for fluorescent lighting fixtures* published in October 1953 ILLUMINATING ENGINEERING is not one which should carry any official standing with the I.E.S. I am not criticizing the publication of the report because I believe that any serious viewpoint on illumination is entitled to an open hearing, but I feel that to have I.E.S. offering quantity reprints for sale is to create in the minds of some, the impression that the rating method has official approval.

There are many detailed criticisms which could be made of the system and I made some of them to Mr. James in various stages of its development, but it seems to me that the fundamental fault is the concept that we can equate different kinds of things numerically and add them to form a total score. The most flagrant example of this is the section on safety. I fail to see how we can properly deal with degrees of safety in an acceptable fixture. For example, a fixture which had a safety score under G1-A of 1000 points and a brightness score under Q3 of 2000 points, would balance a fixture having a safety score of 2000 points and a brightness score of 1000 points. This, it seems to me, is carrying point ratings to a ludicrous extreme.

It is true that Mr. James now says, "There can be nothing 'relative' between an unsafe fixture and one that is safe, but there can be 'plus' features as between various safe fixtures." Actually, doesn't this beg the question? A fixture ought to be designed to be safe beyond any reasonable doubt. If it is, then what significance can there be to giving it more points for more safety and thereby offsetting a deficiency in some other score?

While the consulting engineer does not have to worry about any heart-burnings caused among fixture manufacturers whose products may be excluded on a large installation by a point rating system, it seems to me that he is justified in applying such a system only if he has complete scientific backing for his rating concepts. When we talk about equating construction, architectural appearance and brightness to numerical bases, we are going beyond any scientific justification. WILLARD ALLPHIN, *Sylvania Electric Products, Inc., Salem, Mass.*

*"Comparative Rating Guide for Fluorescent Lighting Luminaires," by L. V. James. Pp. 539-555, October I. E.

BOOKS AND PAMPHLETS

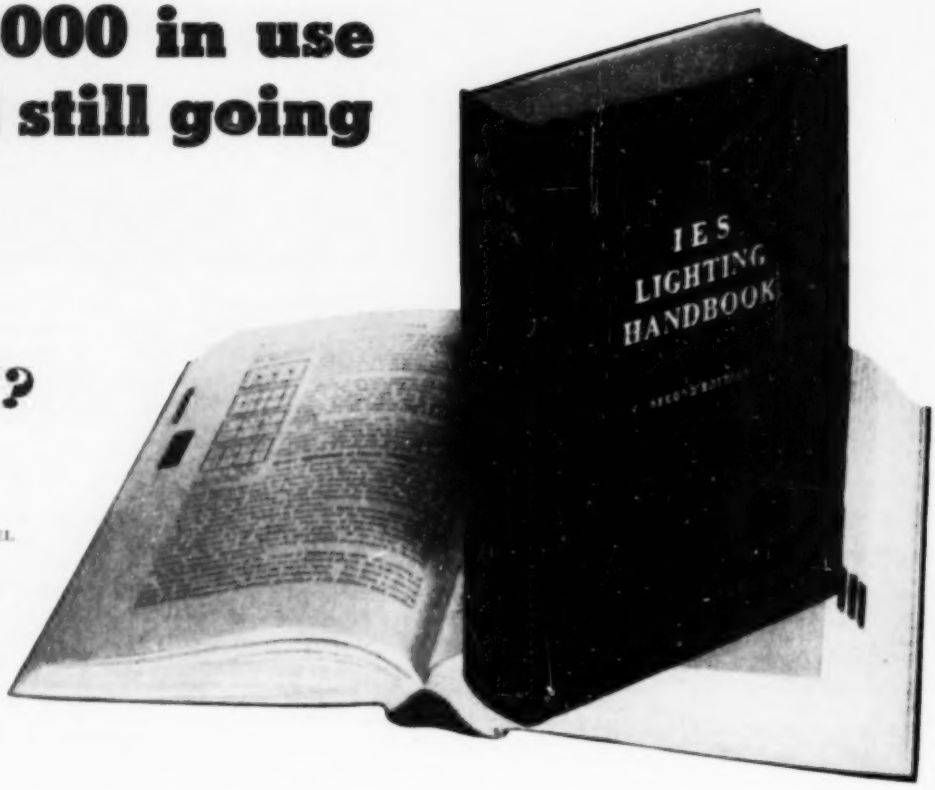
A revised and expanded edition of the **Manual of Traffic Engineering Studies,** is now available from the Association of Casualty and Surety Companies, 60 John St., New York 38, N. Y. Price: $3.75. 278 pages, 253 illustrations.

The book, treating on the methods, forms and analysis of traffic studies, covers 28 different traffic studies, on accident records and facts; high accident frequency locations; driver observance of stop signs, speed reduction signs and traffic signals; motor vehicle occupancy; pedestrian volume, financing and plan-

(Continued on page 21A)

Over 8000 in use ... and still going

HAVE YOU YOURS?



Who Needs the I.E.S. Lighting Handbook

POWER COMPANY PERSONNEL
ELECTRICAL CONTRACTORS
PLANT MAINTENANCE MEN
CONSULTING ENGINEERS
MANUFACTURERS
OPTOMETRISTS
ARCHITECTS
ALL WHO NEED LIGHTING INFORMATION

Price $8.00* per copy

Yes, since January 1952 over 8000 copies of the Second Edition, I.E.S. Lighting Handbook have been sent out in industry . . . to every type of lighting person . . . and in every quarter of the globe from Succasunna, N. J. to Singapore. Small wonder we're now preparing for the second printing of this wonderful reference work for anyone interested in good lighting practice.

Not only does the Handbook show you "how" to do it. It also tells "why" . . . gives you sound background for applying the hundreds of advanced lighting techniques shown in its 987 pages. Illustrates every step of the way with 655 large, clear photographs, charts and curves, and is fully cross-indexed for quick, easy reference. No "light reading" (or pun intended), the Second Edition, I.E.S. Lighting Handbook has been praised by scholars and laymen as the last word in practical lighting information.

If your lighting library is still incomplete (that is, of course, without the *latest* I.E.S. Lighting Handbook), now is the time to place your order for your new Handbook. Preparation and printing delays for a second printing are always unpredictable.

Get your copy now and be sure! Only $8 per copy.

TO — ILLUMINATING ENGINEERING SOCIETY
1860 Broadway, New York 23, N. Y.

Send me promptly ( ) copy(s) of the new IES LIGHTING HANDBOOK at $8.00 per copy. I.E.S. Members: $5.50, if not previously ordered.

☐ My check (money order) enclosed. ☐ Bill me.

Please Print.

NAME .....

Address .....

City ..... Zone ..... State .....

Company ..... Position .....

NOTE: If you care to send payment with this order and so save the Society bookkeeping expense, your courtesy will be sincerely appreciated.

Use Coupon To Order Now

***Substantial Saving to I.E.S. Members**

If you have not yet ordered your "member copy" of the I.E.S. Lighting Handbook, Second Edition, at $5.50, you are entitled to one at this special price, a saving of $2.50. Better get your personal copy now!

I.E.S. National Technical Conferences

September 12-16, 1954 — Chalfonte-Haddon Hall, Atlantic City

September 12-16, 1955 — Statler Hotel, Cleveland

September 16-21, 1956 — Statler Hotel, Boston.

(*Continued from page* 19A)

ning of surveys; analysis of traffic trends and other significant developments in traffic studies.

Standards Are Your Business, a 24-page booklet defining standards of production and their value as tools of management appears in a revised edition issued by the American Standards Association, 70 East 45th St., New York 17, N. Y. The booklet, distributed without charge, gives the philosophy and objectives of the voluntary standards movement in this country, and contains a section on Federal Government policy toward industry standards.

NEW MEMBERS

At the meeting of the I.E.S. Council Executive Committee held in Philadelphia, Pa. November 13, 1953, the following were elected to membership. Names marked * are transfers from Associate Member grade.

ARIZONA CHAPTER

Associate Member:

Buckwell, T. D., Westinghouse Electric Supply Co., Phoenix, Ariz.

BRITISH COLUMBIA SECTION

Associate Member:

Duck, J. W. C., John Duck & Son Ltd., Vancouver, B. C.

CAPITAL SECTION

Associate Members:

Connor, B. K., Potomac Electric Power Co., Washington, D. C.

White, Horace, Vision Associates, Washington, D. C.

CAROLINAS SECTION

Member:

*Proctor, J. B., 2423 Vail Ave., Charlotte, N. C.

Associate Member:

Harper, S. B., Duke Power Co., Durham, N. C.

CENTRAL NEW YORK SECTION

Member:

*Sweetland, L. L., New York State Electric & Gas Corp., Elmira, N. Y.

Associate Member:

McVey, J. J., Niagara Mohawk Power Corp., Syracuse, N. Y.

CHICAGO SECTION

Associate Members:

Gordon, Harold, Gordon Electric Supply, Kankakee, Ill.

Meister, J. B., Commonwealth Edison Co., Chicago, Ill.

Student Member:

Tomaszkiewicz, R. J., University of Illinois, Chicago, Ill.

CLEVELAND SECTION

Associate Members:

Ankrom, W. R., The Ohio Power Co., Canton, Ohio.

Linville, M. A., Cleveland Electric Illuminating Co., Cleveland, Ohio.

Mendelson, S. I., John Paul Jones Cary & Millar, Cleveland, Ohio.

Phillips, D. R., General Electric Co., Cleveland, Ohio.

Russell, A. H., General Electric Co., Cleveland, Ohio.

Sauer, E. B., General Electric Co., Cleveland, Ohio.

Smith, J. D., Cleveland Electric Illuminating Co., Cleveland, Ohio.

Smith, J. H., Westinghouse Electric Corp., Cleveland, Ohio.

Smith, R. L., Holophane Company, Inc., Newark, Ohio.

Stephens, W. R., General Electric Co., Cleveland, Ohio.

CONNECTICUT SECTION

Associate Members:

Benjamin, R. W., Jr., The United Illuminating Co., New Haven, Conn.

Gonya, E. A., Jr., The Miller Co., Meriden, Conn.

EASTERN NEW YORK CHAPTER

Associate Member:

Donnelly, H. I., New York Telephone Co., Albany, N. Y.

EASTERN PENNSYLVANIA SECTION

Associate Members:

Bertolet, W. B., Metropolitan Edison Co., Easton, Pa.

Garlin, W. N., Metropolitan Edison Co., Reading, Pa.

Gruitt, J. F., Metropolitan Edison Co., E. Stroudsburg, Pa.

Moody, F. W., Jr., Pennsylvania Power & Light Co., Harrisburg, Pa.

FLORIDA CHAPTER

Member:

Moos, Frank, 5709 Taliaferro St., Tampa, Fla.

FOREIGN NON-SECTION

Member:

Broadbent, J. K., Polygon Electric Ltd., Capetown, South Africa.

Associate Members:

Mattalon, R. W., 16 Sh. Bersa, Cairo, Egypt.

Paille O., Francisco, Inelectrica, Bucaramanga, Colombia, S. A.

GEORGIA SECTION

Associate Members:

Gossett, T. O., Noland Co., Inc., Macon, Ga.

Hunt, M. E., Jr., Georgia Power Co., Americus, Ga.

Miller, T. W., Thompson Wilson Co., Atlanta, Ga.

Swaim, J. C., Noland Co., Inc., Macon, Ga.

HEART OF AMERICA SECTION

Associate Members:

Gaba, J. H., Squire Electric Co., Kansas City, Mo.

Stewart, D. J., Evans Electrical Construction Co., Kansas City, Kans.

INLAND EMPIRE CHAPTER

Associate Member:

O'Toole, J. K., The Washington Water Power Co., Lewiston, Idaho.

MARYLAND SECTION

Associate Member:

Bowers, R. N., Noland Co. Inc., Hagerstown, Md.

MID-SOUTH CHAPTER

Associate Member:

Spencer, I. E., Sr., Southern College of Optometry, Memphis, Tenn.

Student Members:

McEachern, C. L., Southern College of Optometry, Memphis, Tenn.

Magee, J. I., III, Southern College of Optometry, Memphis, Tenn.

MILWAUKEE SECTION

Associate Members:

Kuehl, R. J., 3160 S. 48th St., Milwaukee, Wis.

Schumaker, William, Northern Light Co., Milwaukee, Wis.

MONTREAL SECTION

Associate Members:

Figler, Israel, Electrolier Mfg. Co. Ltd., Montreal, Que.

Monaghan, B. J., Northern Electric Co. Ltd., Montreal, Que.

Snow, D. A., Electrolier Mfg. Co. Ltd., Montreal, Que.

NEW ORLEANS SECTION

Associate Members:

Colvin, N. L., Louisiana Power & Light Co., Gretna, La.

Landry, J. A., Louisiana Power & Light Co., Gretna, La.

NEW YORK SECTION

Members:

Ahern, W. R., National Broadcasting Co., New York, N. Y.

*Prescott, R. D., 1860 Broadway, New York, N. Y.

Associate Members:

Campbell, E. A., Better Light Better Sight Bureau, New York, N. Y.

Gardner, D. H., Duro-Test Corp., N. Bergen, N. J.

Markush, E. C., 138 Lexington Ave., New York, N. Y.

Paulauskas, Justin, Weston Electrical Instrument Co., Newark, N. J.

Penny, L. ., New York State Electric & Gas Co., Brewster, N. Y.

Schmidt, W. R., General Electric Co., Newark, N. J.

Shaw, J. E., Corning Glass Works, New York, N. Y.

Thorington, Luke, Westinghouse Electric Corp., Bloomfield, N. J.

Student Members:

Siegel, I. M., Columbia University, New York, N. Y.

Thaler, Jerome, Columbia University, New York, N. Y.

Wexler, Gerald, Columbia University, New York, N. Y.

(*Continued on page* 30A)

COMMITTEES

COMMITTEES 1953-1954

All committees are appointed by the President, subject to approval of the Council and, except as provided in the Constitution, terminate at the time of the first Council meeting each administration, in the month of October. The scope of each committee is indicated.

A. H. Manwaring, President, ex-officio member of all committees.

STANDING COMMITTEES

BOARD OF FELLOWS — To evaluate the eligibility of candidates for transfer to the grade of Fellow and recommend their election by Council.

A. A. Brainerd, Chairman, Philadelphia Electric Co., 1015 Chestnut St., Philadelphia, Pa.

W. V. C. Foulks — J. M. Ketch
S. G. Hibben — H. L. Logan
E. F. Lowry

COUNCIL EXECUTIVE — To conduct the affairs of the Society between Council meetings.

A. H. Manwaring, Chairman, Philadelphia Electric & Mfg. Co., 1228 N. 31st St., Philadelphia, Pa.

R. F. Hartenstein — K. M. Reid
D. M. Jones — M. N. Waterman

FINANCE — To direct supervision of the financial affairs of the Society, to present annual report on its financial condition and make recommendations to Council as to investments of money and upon all specific appropriations.

W. W. Booth, Chairman, General Electric Co., 1260 Boston Ave., Bridgeport, Conn.

Paul H. Hildebrand — Kirk M. Reid, ex-officio
George J. Taylor

GENERAL BOARD OF EXAMINERS — Evaluate the eligibility of applicants for admission to membership or transfer to the grade of Member and submit to Council their nominees for elections to the grade of Member Emeritus.

Clifford Miller, Chairman, Consolidated Edison Co. of N. Y. Inc., 4 Irving Place, New York, N. Y.

T. O. Jorgensen — R. R. Wylie

MEDAL AWARD — To consider qualifications of candidates for I.E.S. Medal; submit recommendations to Council and prepare citation for the award.

J. O. Kraehenbuehl, Chairman, University of Illinois, Urbana, Ill.

George Crampton — S. G. Hibben
G. F. Dean — C. O. Martin
C. H. Goddard — E. M. Strong
O. K. Hardacre — Walter Sturrock
Ward Harrison — H. L. Wright

PAPERS — To procure, review and approve all technical papers and discussions thereof, for presentation before National Conferences of the Society.

R. M. Zabel, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

L. E. Barbrow, Vice-Chairman, National Bureau of Standards, Washington, D. C.

L. J. Buttolph — B. F. Greene
C. L. Cottrell — W. P. Lowell, Jr.
George Gilleard — G. A. Trosper
H. L. Wright

PUBLICATIONS — To be responsible for the procurement, review and approval of all material for the publications of the Society other than technical papers approved by the Papers Committee for presentation at National Conferences of the Society and their discussions and committee reports, for which it will have publication responsibility only. Shall also be responsible for the editing, printing and business management of the publications of the Society.

J. S. Schuchert, Chairman, Duquesne Light Co., 425 Sixth Ave., Pittsburgh, Pa.

G. T. Anderson — Aileen Page
E. H. Church — John Ronayne
H. G. Clum — R. M. Zabel

Subcommittee on Changes and Improvements

H. G. Clum, Chairman, Silvray Lighting, Inc., 100 W. Main St., Bound Brook, N. J.

Subcommittee on Editorial Content

R. M. Zabel, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

L. E. Barbrow — George Gilleard
L. J. Buttolph — B. F. Greene
H. G. Clum — W. P. Lowell, Jr.
C. L. Cottrell — G. A. Trosper
H. L. Wright

Subcommittee on Publications Sales

John Ronayne, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

Subcommittee on Technical Data Sheets

E. H. Church, Chairman, Benjamin Electrical Mfg. Co., Des Plaines, Ill.

George T. Anderson — Aileen M. Page

GENERAL COMMITTEES

ADVANCE PLANNING—To study the operation, program, publication activities, membership classifications and financial structure with a view of its immediate and long-range objectives and to make recommendations to Council.

C. C. Keller, Chairman, Holophane Co., Inc., 342 Madison Ave., New York, N. Y.

R. L. Biesele, Jr. — B. J. Jensen
George Evans — E. M. Strong
J. F. Whitehead, Jr.

ADVISORY BOARD ON COMMITTEE PERSONNEL — To examine the organization, accomplishments, and assignments of committees and prepare not later than June 1st of each year a proposed list of committees and personnel.

D. M. Jones, Chairman, Curtis Lighting Co. of Canada, Ltd., 991 St. Antoine St., Montreal W, Que.

C. L. Crouch — R. F. Hartenstein
C. C. Keller — A. D. Hinckley
E. M. Strong

BOARD OF NOMINATION — To prepare a nomination ticket containing the names of those who are deemed best suited to serve as officers and directors in positions to be filled at the ensuing election.

Walter Sturrock, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

S. G. Hibben — E. M. Strong
(With Section Representatives)

CONSTITUTION AND BY-LAWS — To prepare for Council amendments to the Constitution.

Walter Sturrock, Chairman, General Electric Company, Nela Park, Cleveland, Ohio

G. W. Beals — Myrtle Fahsbender
G. F. Dean — G. K. Hardacre

COORDINATING COMMITTEE FOR DEFENSE — To contact various Government Agencies concerned with National Security suggesting cooperation and participation in specific projects as an aid to solution of their problems. Recommending the placement of lighting study projects in present committees or the appointment of study project committees to the Society President and to expedite such study projects and guide accepted reports into proper Government channels.

G. D. Mills, Co-Chairman, Department of National Defense, New Army Bldg., Ottawa, Ont.

A. F. Wakefield, Co-Chairman, The F. W. Wakefield Brass Co., Vermilion, Ohio

J. W. Bateman — S. L. Drumm
H. R. Blackwell — K. M. Reid
O. P. Cleaver — John S. Walsh
C. L. Crouch — M. N. Waterman

Artificial Moonlight — Engineer Corps.

Illumination and Color Standards for Conservation of Vision — Air Force.

HISTORICAL — To assemble and make available for current reference and to prepare in suitable and durable form for posterity, such historical facts, printed memorabilia, photographs, voice records, museum specimens and allied items as may be judged worthy of composing a continuing digest of the record of the Society's history.

S. G. Hibben, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

R. B. Burton, Sr. — Julius Daniels
Leo Dolkart — C. A. B. Halvorson
Charles Franck — J. L. Stair
G. H. Stickney

LIGHTING SERVICE — To conduct a Lighting Service Forum in connection with the National Technical Conference.

L. E. Tayler, Chairman, Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

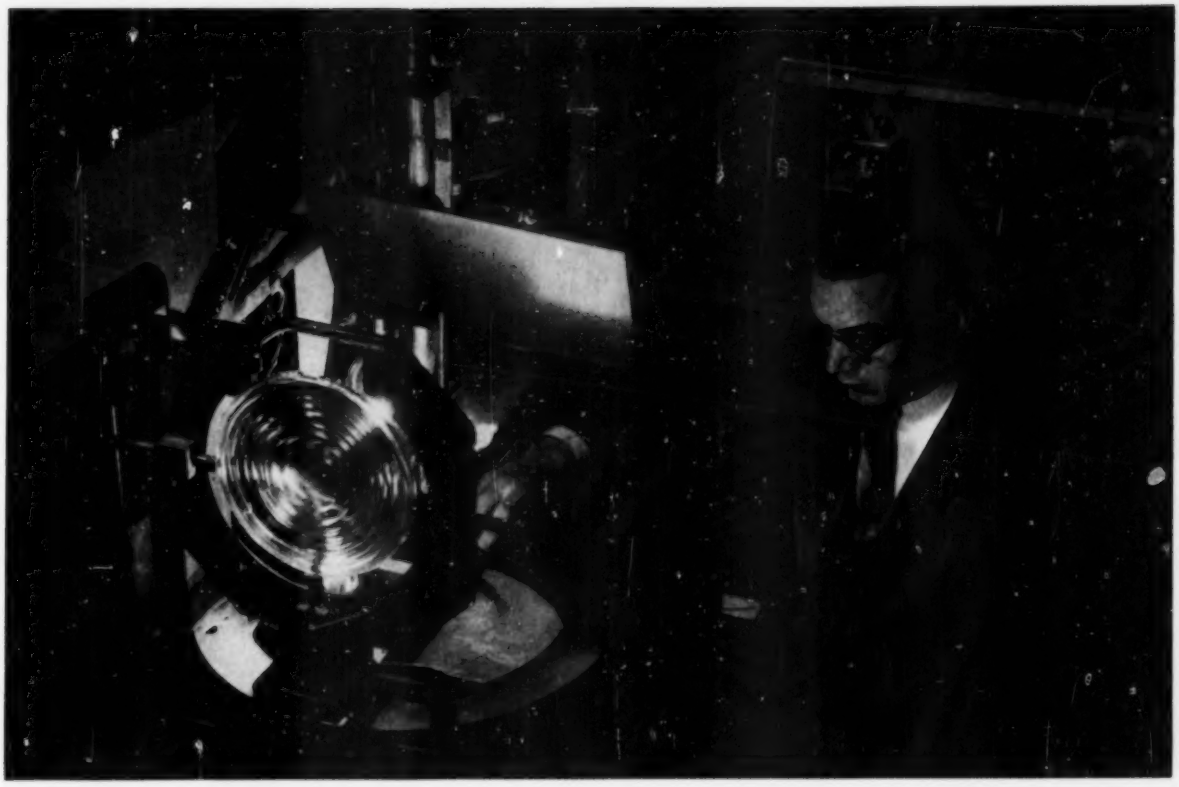
MEMBERSHIP — To develop plans and supervise the operation of the individual membership campaign in the Society.

T. W. Lauer, Chairman, Rumsey Electric Co., 1007 Arch St., Philadelphia, Pa.

(With Section and Chapter Representatives)

NATIONAL TECHNICAL CONFERENCE — To be completely responsible, subject to the approval of Council, for the general coordination of all conference activities, for selecting and recommending time and place, for review and approval of the plans and budgets of the National Technical Conference Executive Committee and in cooperation with the Papers Committee for the satisfactory time allocation for the Technical Papers sessions; according to Procedures and Policies as adopted by Council.

(*Continued on page* 25A)



TOUGH SPECIFICATIONS

are KOPP's "meat"!

Two views of Kopp's "hand" shop, pressing (above) and blowing (below).

Through extensive experience in the design and manufacture of technical glass products, and the close integration of engineering and manufacturing facilities, Kopp meets the most exacting specifications for glass products.

Working to a given set of conditions, every step from the design of the part to the checking of the samples is carried out in our own laboratories and shops. Glass for production runs is melted in individual muffled pots and worked by skilled hand workers. Careful checking during manufacture and before shipping insures strict adherence to specifications.

Only in this way can engineered products such as we make be produced on an economically sound basis.

KOPP GLASS

KOPP GLASS, Inc.
SWISSVALE, PA.

"...I'd say we made a sound investment in our Day-Brite lighting"

says Arthur Meier, Manager, Boyd's Men's Store, Clayton, Missouri.

MR. MEIER REPORTS: "Using sales as a barometer, I'd say we made a sound investment in our Day-Brite lighting. Especially at night, we're attracting a lot of store traffic. We can and are selling men's apparel at night with full assurance that color will not change in daylight conditions."

Boyd's in Clayton chooses Day-Brite's Mobilex® and Derby Downlights to light new store

The problem: lighting for a men's clothing store in a smart suburban shopping area where competition is keen. Objectives of lighting: (1) to make location dominant, (2) to get distinctive appearance at reasonable cost, (3) to provide properly balanced illumination for accurate nighttime appraisal of merchandise.

The solution: rectangular patterns of fluorescent Day-Brite MOBILEX with plastic panels and incandescent louvered Day-Brite Derby Downlights at each corner of MOBILEX patterns.

The recessed lighting units leave the ceiling smooth and unbroken. Visibility is excellent in every corner of the store. Light meter readings show 140 footcandles of illumination—yet the installation is extremely comfortable. There are no harsh shadows or glare.

The warm "punch" light of the Derbies give the installation sparkle and brilliance, and, teamed with MOBILEX, produce color balanced lighting for accurate appraisal.

385

MOBILEX and Derby Downlights are only one of many answers Day-Brite has to meet your needs for store lighting fixtures that stimulate sales and improve business for your customers. We invite you to write for more information. Day-Brite Lighting, Inc., 5432 Bulwer Ave., St. Louis 7, Mo. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

C. N. Laupp, Chairman, Wisconsin Electric Power Co., 231 W. Michigan St., Milwaukee, Wis.

C. L. Amick	A. D. Hinckley
C. J. Berry	L. E. Tayler
W. W. Booth	A. S. Turner
G. F. Dean	L. C. Twichell
J. C. Forbes	M. N. Waterman
R. F. Hartenstein	R. M. Zabel

Conference Executive Committee

A. S. Turner, Chairman, General Electric Co., 1405 Locust St., Philadelphia, Pa.

PROCEDURES AND POLICIES — Analyze for Council current procedures and policies and make recommendations.

E. M. Strong, Chairman, Cornell University, Ithaca, N. Y.

G. W. Beals	W. A. Stannard
J. S. Schuchert	Walter Sturrock
C. C. Shotwell	J. F. Whitehead, Jr.

F. C. Winkler

PUBLIC RELATIONS AND INFORMATION — To prepare and disseminate information about the activities, accomplishments, programs, objectives and policies of the Society and about the place of illuminating engineering in modern society; to formulate and submit public relations policies and plans for the Society.

J. F. Whitehead, Jr., Chairman, Day-Brite Lighting Corp., 5411 Bulwer Ave., St. Louis, Mo.

Berlon C. Cooper	T. W. Lauer
E. T. Glaser	Herbert Plishker
H. H. Green	G. B. Roscoe
A. W. Hooper	C. C. Shotwell
M. B. Hastings	A. F. Wakefield

S. B. Williams

(With Section and Chapter Representatives)

REGIONAL ACTIVITIES — To represent the respective Regions before the Council and to keep the Council informed regarding the affairs of the Regions. To stimulate Society activities, to encourage joint meetings of Sections and Chapters including Regional Conferences within the respective Regions and to promote the expansion of the Society.

R. F. Hartenstein, Chairman, Ohio Edison Co., Akron, Ohio.

C. J. Berry	M. J. Myers, Jr.
G. B. Buck, II	Glenn E. Park
M. B. Hastings	C. B. Pederson
L. A. Hobbs	G. J. Taylor
W. J. Lind	L. C. Twichell

RESIDENCE LIGHTING FORUMS — To stimulate and assist the Residence Lighting Forums of the Society and to encourage the formation of additional Forums. To conduct a Residence Lighting Forum in connection with the National Technical Conference.

Katharine T. Goodall, Chairman, Philadelphia Electric Co., 900 Sansom St., Philadelphia, Pa.

Edith Buchholtz	Judd Lough
Mary Dodds	Winonah Murphy
Lillian Eddy	Jan Reynolds
Myrtle Fahsbender	Frances E. Rosier
May Love Gale	Kerr Sanders, Jr.

Mary Taepke

SUSTAINING MEMBERSHIP — To obtain additional Sustaining Members.

C. C. Shotwell, Chairman, Philadelphia Electric Co., 1000 Chestnut St., Philadelphia, Pa.
E. H. Church, Vice-Chairman, Benjamin Electric Mfg. Co., Des Plaines, Ill.

G. F. Dean	Charles R. Long
Leon T. Johnson	W. C. Mutchler

R. C. Paslay

(With Section and Chapter Representatives)

TASK COMMITTEES

LIGHTS DIAMOND JUBILEE—1954

S. G. Hibben, Chairman, Westinghouse Electric Co., Bloomfield, N. J.

TRUSTEES, I.E.S. HEADQUARTERS RETIREMENT PENSION PLAN

S. G. Hibben, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

W. W. Booth	K. M. Reid

E. M. Strong

I.E.S. - U. S. PUBLIC HEALTH SERVICE — To outline a method of making a survey of the visual factors of the working environment and the workers' vision and evaluating the findings in terms of visual comfort and effectiveness and eye health.

J. F. Parsons, Chairman, Niagara Mohawk Power Corp., Buffalo, N. Y.

B. S. Benson	George Clayton
Mrs. Tula Brocard	Neal Jacobus
L. J. Cahill	A. L. Koven

R. P. Teele

TECHNICAL COMMITTEES

AVIATION LIGHTING — To study the application of light and lighting to the spaces and functions involved in the operation of aircraft.

D. C. Miller, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

H. J. C. Pearson, Vice-Chairman, Civil Aeronautics Administration, Technical Development Division, Indianapolis, Ind.

P. H. Greenlee, Secretary, Grimes Mfg. Co., Urbana, Ohio.

J. F. Angier	G. M. Kevern
F. C. Ashe	A. L. Lewis
J. P. Bartow	R. E. Madigan
H. R. Blackwell	N. H. McIntyre
R. C. Blatt	W. E. K. Middleton
F. B. Brady	L. B. Moore
F. C. Breckenridge	W. A. Pennow
A. H. Clarke	T. H. Projector
H. A. Cramer	V. J. Roper
R. E. Dahlin	L. C. Simpson
I. F. Fagin	R. J. Stefany
W. C. Fisher	L. C. Vipond
Kurt Franck	Martin Warskow
J. P. Hoxie	A. B. Winters

CIVIL DEFENSE, LIGHTING FOR — To appraise and report on special lighting problems connected with emergency military operations that directly involve civilian defense and protection, such as equipment for bomb shelters, special street and vehicular lighting, mobile self-contained lighting facilities for use in bombed areas, and emergency lighting devices and visual aids to movement in the event of power failure.

J. W. Bateman, Co-Chairman, Canadian General Electric Co., Ltd., 165 Dufferin St., Toronto, Ont.

J. C. Forbes, Co-Chairman, General Electric Co., 570 Lexington Ave., New York, N. Y.

J. S. Walsh, Secretary, Pacific Gas & Electric Co., 245 Market St., San Francisco, Calif.

T. W. Birt	J. C. Nickerson
R. B. Brown, Jr.	Kirk M. Reid
K. E. Hollingsworth	R. G. Scott
W. F. Little	T. H. Shepherd
G. D. Mills	H. E. Stafford

COLOR AND ILLUMINATION — To study, evaluate and report on the effect of color in relation to the art and science of illumination.

J. A. Meacham, Chairman, Sherwin-Williams Co., Midland Bank Bldg., Cleveland, Ohio.

R. C. Allison, Vice-Chairman, T. Eaton Company, 190 Yonge St., Toronto, Ont.

R. L. Biesele, Jr.	R. M. Hanes
A. A. Brainerd	Harry Helson
L. H. Brown	C. F. Jensen
R. A. Boyd	W. H. Kahler
C. L. Cottrell	H. L. Logan
R. M. Evans	Gladys Miller
Dean Farnsworth	Dorothy Nickerson
C. E. Foss	W. D. Riddle
W. C. Granville	Francis Scofield
S. K. Guth	D. E. Spencer

G. F. Wakefield

DAYLIGHTING — To study the problems involved in daylighting, develop recommended practices and report thereon.

R. A. Miller, Chairman, Pittsburgh Plate Glass Co., 420 Fort Duquesne Blvd., Pittsburgh, Pa.

H. B. Vincent, Vice-Chairman, Owens-Illinois Glass Co., 1700 N. Westwood Ave., Toledo, Ohio.

W. J. Arner	F. L. Knowles
G. F. Bauer	W. F. Little
R. L. Biesele, Jr.	H. E. Machamer
F. W. Bishop	R. W. McKinley
R. A. Boyd	J. A. Meacham
H. S. Bull	E. C. Miles
W. W. Caudill	D. R. Muir
E. W. Conover	S. W. Quisenberry
Doyt Early	W. C. Randall
W. B. Ewing	F. K. Sampson
W. E. Folsom	D. E. Spencer
B. F. Greene	G. W. Thomas
C. D. Gibson	E. E. Vesey
J. W. Griffith	Andrew Vogel
H. S. Herbert	K. C. Welch
G. N. Hingston	O. F. Wenzler

FARM LIGHTING *(Formerly Farm Buildings and Work Area Lighting)* — To study the application of light and lighting of farm buildings, surrounding work areas and other rural locations and to report thereon.

O. C. Lange, Chairman, Pennsylvania Power & Light Co., 9th and Hamilton Sts., Allentown, Pa.

T. M. Barr	O. D. Hunt
Edith Buchholtz	Arthur Kramer
J. P. Ditchman	Howard Long
P. H. Hildebrand	Joseph Schaenzer

A. J. VonBurg

I.E.S. - A.S.H.V.E. JOINT COMMITTEE — To study the relationship between lighting and various factors that enter into air conditioning and report thereon.

Walter Sturrock, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

R. W. McKinley	E. H. Salter

A.S.H.V.E. Cooling Load Subcommittee

John Everetts, Jr.	A. T. Jorn

J. N. Livermore

ILLUMINATION PERFORMANCE RECOMMENDATIONS — To prepare illumination performance recommendations for luminaires conforming to I.C.I. classifications, excluding residential.

B. S. Benson, Jr., Chairman, Benjamin Electric Mfg. Co., Des Plaines, Ill.

Kurt Franck	W. F. Little
S. K. Guth	J. F. Parsons
Leslie Innis	R. P. Teele
W. H. Kahler	G. F. Wakefield

William Weibel

INDUSTRIAL LIGHTING — To initiate, follow up and coordinate lighting study projects in the industrial field, review the reports of the various subcommittees in this field and make recommendations to Council.

J. R. Chambers, Chairman, Benjamin Electric Mfg. Co., Des Plaines, Ill.

A. A. Brainerd	C. C. Keller
C. E. Egeler	W. H. Kahler
C. D. Hollister	Howard Long

W. P. Lowell, Jr.

Lighting in the Canning Industry

Carl O. Martin, Chairman, Benjamin Electric Mfg. Co., 829 Folsom St., San Francisco, Calif.

L. H. Brown	Robert S. Prussia
S. H. Hazelton, Jr.	Robert Thallon
K. M. Noble	D. C. White

H. K. Wilder

Lighting of Central Station Properties

L. G. Parks, Chairman, Ebasco Services Inc., 2 Rector St., New York, N. Y.

A. A. Brainerd	C. E. Egeler
R. S. Bucher	R. M. Graves
H. F. Carroll	Carter Lewis
H. A. Cook	W. S. Mowry
R. W. Corwin	D. J. O'Neill
H. E. D'Andrade	C. B. Stephens
V. L. Dzwonczyk	D. W. Taylor

(Continued on page 27A)

Sola Constant Wattage Ballast for Rapid-Start Lamps

saves dollars on maintenance for only 5 pennies a year

The price of the lamp is only a small part of the total cost of relamping a fluorescent ceiling fixture. There is also the loss of efficiency resulting from lack of light until the lamp is replaced, plus salary for one or more maintenance men to relamp. High maintenance costs are, however, no longer a problem with Sola-ballasted, rapid-start fluorescent lighting systems. This is true for two reasons.

First, Sola Rapid-Start Ballasts have a higher open-circuit voltage (300v.) from the lamp to the starting aid for positive starting and consequent long starting life.

Second, Sola Rapid-Start Ballasts have an unusually low peak/rms current ratio (approx. 1.5 at 118v.)—an important factor in long lamp operating life.

In addition, the patented Sola Constant Wattage Circuit results in lumen output constant within ±2% regardless of line voltage fluctuations from 106-130v.

This premium quality Sola ballast costs less than 25c additional as original equipment. Amortized over a typical 5-year life of a rapid-start lamp this amounts to only 5c per year . . . it saves many dollars per year.

Leading architects, consulting engineers, and users want good, dependable, economical lighting. They can get it with a rapid start fluorescent lighting system operating from a Sola Constant Wattage Ballast.

SOLA *Constant Wattage* **BALLASTS**

We will be happy to give you all the facts. Phone for a Sola sales representative, or write for Bulletin CFL-191.

Transformers for: Constant Voltage • Fluorescent Lighting • Cold Cathode Lighting • Mercury Vapor Lighting • Luminous Tube Signs
SOLA ELECTRIC CO., 4633 W. 16th Street, Chicago 50, Illinois, Bishop 2-1414 • *NEW YORK 35: 103 E. 125th St., TRafalgar 6-6464*
PHILADELPHIA: Commercial Trust Bldg., RIttenhouse 6-4988 • BOSTON: 272 Centre St., Newton 58, Mass., Bigelow 4-3354
CLEVELAND 15: 1836 Euclid Ave., PRospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • Reps. in Other Principal Cities

Lighting in the Clothing Industry

Norman Kridel, Chairman, Rochester Gas and Electric Co., 89 East Ave., Rochester, N. Y.

B. A. Thomas — L. C. Twichell
Carl Uthe

Lighting in Laundries

O. A. Hill, Jr., Chairman, Public Service Co. of Northern Illinois.

G. F. Allen — Carl W. Jensen
J. R. Chambers — R. R. Lusk
A. L. Christensen — W. S. E. Miller
R. R. Hill — A. A. Sobolik

Mine Lighting

C. M. Crysler, Chairman, General Electric Co., 238 W. Carson St., Pittsburgh, Pa.

Lighting in Sheet Metal, Stamping, Folding and Shearing Industry

Floyd W. Sell, Chairman, Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

H. A. Boltz — J. M. Marlin
E. L. Frase — T. H. Roughley

Lighting in Saw Mills

James Barnes, Chairman, Pacific Gas and Electric Co., San Rafael, Calif.

D. M. Finch — John Keyes
Manuel Frita — Norman Schiewe
Jerry Howard — P. S. Schmidt
K. B. Stoddard

Lighting in the Textile Industry
(Joint Committee with A.S.M.E.)

W. L. Kelley, Jr., Chairman, N. E. Machine & Electric Co., 77 Bayley St., Pawtucket, R. I.

Lighting for Graphic Arts — Printing Industry

Ralph Enghauser, Chairman, Sylvania Electric Products, Inc., 1938 Lincoln Liberty Bldg., Philadelphia, Pa.

Perc Holmes — J. Wallace Scott

LIGHT CONTROL AND EQUIPMENT DESIGN — Collect and correlate the knowledge and data on means and methods of controlling, directing, reflecting, transmitting and diffusing light and on the principles and practices of equipment design.

D. L. Williams, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

G. R. Baumgartner — M.P. Morse
B. S. Benson, Jr. — F. M. Neal
R. D. Bradley — C. N. Sprankle
G. C. Moore — F. C. Winkler

LIGHT SOURCES — To correlate and report available information as to the physics of light and light production and the characteristics of current light sources.

H. F. Davidson, Chairman, Hydro-Electric Power Commission of Ontario, 620 University Ave., Toronto, Ont.

Charles Amick — George Freeman
W. T. Anderson — B. F. Greene
L. E. Barbrow — E. F. Lowry
H. J. Berka — W. W. Lozier
James Cox — E. H. Raddin
E. H. Salter

Subcommittee on Color Rendition

Dorothy Nickerson, Chairman, 2039 New Hampshire Ave. N. W., Washington 9, D. C.

A. C. Barr — Norman Macbeth
C. W. Jerome — G. R. Stilwell
Deane B. Judd — Luke Thorington
Arthur Weeks

LIGHTING DESIGN PRACTICE — To study published data on coefficients of utilization, room indexes, maintenance coefficients and other elements entering into calculations for lighting design; develop standard methods for use in Society publications and report thereon.

J. Roy Jones, Chairman, Westinghouse Electric Corp., Bloomfield, N .J.

B. S. Benson, Jr. — J. J. Neidhart
G. W. Clark — J. F. Parsons
Neal Jacobus — W. M. Potter
J. O. Kraehenbuehl — G. G. Rae
J. A. Losh — E. H. Salter
William Weibel

LIGHTING EDUCATION — To prepare educational and training programs on the fundamentals of illumination, lighting design problems and advance theories of light and lighting application. To prepare required text material and to further their adoption locally.

H. H. Magdsick, Chairman, 15724 Brewster Rd., Cleveland, Ohio.

Abraham Abramowitz — J. O. Kraehenbuehl
W. H. Billhartz — R. W. McKinley
L. H. Brown — R. C. Putnam
R. I. Bull — Alston Rodgers
O. P. Cleaver — E. M. Strong
W. V. C. Foulks — L. E. Tayler
C. R. Granberry — T. D. Wakefield
I. A. Yost

Subcommittee on Survey of Employment Potential for Professionally Trained Illuminating Engineers

W. V. C. Foulks, Chairman, Curtis Lighting Inc., 6135 W. 65th St., Chicago 38, Ill.

O. P. Cleaver — L. E. Tayler
R. W. McKinley — I. A. Yost

Subcommittee on Curriculum

L. H. Brown, Chairman, Stanford University, Stanford, Calif.

Abraham Aramowitz — J. O. Kraehenbuehl
C. R. Granberry — R. C. Putnam
E. M. Strong

Subcommittee on Revision of "Experiments with Light"

W. H. Billhartz — Alston Rodgers
T. D. Wakefield

LIGHTING MAINTENANCE — To study the elements contributing to maintenance factors; set up the framework of typical field studies to determine factors; and to stimulate the prosecution of such studies by appropriate agencies.

R. F. Townsend, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

R. D. Bradley — C. M. Holden
A. A. Brainerd — M. E. Keck
R. D. Burnham — Howard Long
E. H. Church — E. F. Lowry
Francis Clark — W. M. Nottleman
H. R. Davies — R. P. Teele
L. M. Endres — J. W. Tuttle
R. R. Enghouser — Fred Vorlander
I. E. Zastrow

NOMENCLATURE — To define the terms and standards of illumination; and endeavor to obtain uniformity in nomenclature.

D. M. Finch, Chairman, University of California, Div. of Electrical Engineering, Berkeley, Calif.

J. O. Kraehenbuehl, Vice-Chairman, University of Illinois, Urbana, Ill.

Abraham Abramowitz — L. A. Jones
E. Q. Adams — W. F. Little
L. E. Barbrow — W. W. Menke
Robert Bromberg — Priscilla Presbrey
C. L. Cottrell — Harris Reinhardt
H. P. Gage — C. C. Shotwell
S. K. Guth — H. P. Steele

OFFICE LIGHTING — To study the lighting requirements of office lighting tasks, develop suitable lighting recommendations and report thereon.

John J. Neidhart, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

G. F. Dean, Vice-Chairman, Toronto Hydro-Electric System, 14 Carlton St., Toronto, Ont.

A. S. Almryde — R. L. Oetting
C. T. Bakeman — G. G. Rae
David Bluford — T. H. Shepherd
L. M. Endres — G. J. Taylor
W. E. Folsom — Roger T. Waite
C. W. Macy — G. P. Wakefield
R. W. McKinley — R. L. Zahour

Subcommittee on Direct Glare

R. L. Oetting, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

R. W. McKinley — G. T. Taylor
J. J. Neidhart — R. L. Zahour

Subcommittee on Reflected Glare

G. P. Wakefield, Chairman, F. W. Wakefield Brass Co., Vermilion, Ohio.

A. S. Almryde — Charles Macy
L. M. Endres — Roger T. Waite

PROGRESS — To keep in touch with developments in the art of lighting throughout the world and prepare a yearly review of achievements in the art of illuminating engineering for inclusion in ILLUMINATING ENGINEERING.

E. W. Beggs, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

A. C. Barr, Vice-Chairman, General Electric Co., Cleveland, Ohio.

PROTECTIVE LIGHTING — To prepare standards for protective lighting of plants, yards, boundary fences, adjoining highways, railroad sidings, and waterway approaches for the purpose of reducing fire and theft risks, and making policing more effective.

J. W. Lee, Chairman, Philadelphia Electrical and Mfg. Co., 1236 N. 31st St., Philadelphia, Pa.

R. T. Dorsey — Van Edward Marker
M. C. Harsh — D. W. Rowten
H. E. Mahan — G. G. Rae

PUBLIC CONVEYANCES — INTERIOR LIGHTING — To study the application of light to all public areas in conveyances used for passenger transportation, including particularly trains, buses, ships, street railways and subways and report thereon.

C. E. Egeler, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

A. L. Arenberg — E. Hatch
W. N. Bodkin — J. L. Heine
J. C. de la Rosa — H. H. Helmbright
A. R. Elmendorf — J. L. Swarner
E. B. Hallman — W. C. Wheeler

Lighting in Buses, Trolleys and Railroad Cars

J. L. Swarner, Chairman, Pullman Standard Mfg. Co., 10909 Cottage Grove Co., Chicago, Ill.

A. L. Arenburg — C. B. Mackay
J. C. de la Rosa — T. S. Madonia
E. B. Hallman — F. T. Snider
H. H. Helmbright — W. C. Wheeler

Marine Lighting

C. W. Cornbrooks, Chairman, U. S. Dept. of Commerce, Maritime Administration, Washington, D. C.

W. M. Adrian — H. F. Harvey, Jr.
E. Boghosian — A. L. Mortenson
J. B. Feder — R. M. Timmons
E. A. Geary — A. Vandervelde

RESEARCH — To survey and report on all significant research dealing directly or indirectly with the application of light and lighting and its effect upon the performance and comfort of human beings not conducted by the I.E.S. Research Fund, to survey the whole field of lighting; to determine and report on subjects which require scientific verification through research, and to coordinate various types of research affecting lighting which are now being conducted by various agencies.

Willard Allphin, Chairman, Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass.

S. K. Guth — John O. Kraehenbuehl
H. L. Logan — Domina Eberle Spencer

RESIDENCE LIGHTING — To study the application of light and lighting to the home, including the study of the aesthetic phase of residential lighting, and to report thereon.

Norman Vacha, Chairman, John C. Virden Co., 6009 Longfellow Ave., Cleveland, Ohio.

G. R. Baumgartner — C. C. Keller
Mary E. Dodds — Priscilla Presbrey
Myrtle Fahabender — Jan Reynolds
Stella Fetzer — Y. L. Ripley
E. W. Halteman — Mary B. Taepke
Caroline Horn — Morris Thau
Bruce J. Jensen — Mary E. Webber

SCHOOL LIGHTING — To study the application of light and lighting to the spaces and processes involved in educational institutions and to report thereon.

J. M. Chorlton, Chairman, Board of Education, 155 College St., Toronto, Ont.

C. J. Allen, Secretary, General Electric Co., Nela Park, Cleveland, Ohio.

Willard Allphin	L. V. James
R. L. Biesele, Jr.	John J. Neidhart
R. D. Bradley	C. N. Laupp
L. H. Brown	H. L. Logan
W. G. Darley	J. D. MacConnell
H. F. Davidson	J. F. Parsons
A. A. Eastman	R. C. Putnam
W. V. C. Foulks	H. A. Stroud
D. B. Harmon	Paul Seagers
Ray L. Hamon	John Walsh
R. C. Hultgren	E. M. Strong
Chester Jarrett	Marjorie Young

Subcommittee on Bibliography of School Lighting

Leland H. Brown, Chairman, Stanford University, Stanford, Calif.

Subcommittee on Chalkboards

H. F. Davidson, Chairman, Hydro-Electric Power Commission of Ontario, 620 University Ave., Toronto, Ont.

Subcommittee on Student Vision and Scholarship

A. A. Eastman, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

Subcommittee on Visual Problems

Paul Seagers, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

Subcommittee on Electrical Lighting Design

J. F. Parsons, Chairman, Niagara-Mohawk Power Corp., Electric Bldg., Buffalo, N. Y.

SEARCHLIGHT — To study the design and application of searchlights and to report thereon.

T. H. Projector, Chairman, National Bureau of Standards, Washington, D. C.

W. T. Anderson, Jr.	Arthur Hatch
J. A. Bartelt	G. M. Kevern
Stewart Belden	J. P. Latil
John C. Boggs	C. R. Long
E. Boghosian	W. W. Lozier
Col. B. G. Brown	H. N. McIntyre
A. H. Clarke	Peter Meie
C. E. Egeler	Capt. C. H. Orr
W. C. Fisher	W. A. Pennow
C. R. Finch	John A. LeRoche
George Gerung	David A. Walsh

SIGNAL LIGHTING, ELEMENTS OF—To compile a compendium of current information on all phases of signal lighting.

F. C. Breckenridge, Chairman, National Bureau of Standards, Washington, D. C.

J. A. Bartelt	W. E. K. Middleton
H. R. Blackwell	H. J. C. Pearson
Robert Blatt	V. J. Roper
C. L. Crouch	L. C. Simpson
G. M. Kevern	R. T. Tousey

M. A. Warskow

Editorial Board

F. C. Breckenridge, Chairman, National Bureau of Standards, Washington, D. C.

H. R. Blackwell	W. E. K. Middleton
C. L. Crouch	J. M. Waldram

SPORTS AND RECREATIONAL AREA LIGHTING — To develop current recommended practices for lighting sports and recreational areas; study techniques of application including effects on player performance and spectator visibility and report thereon.

Merle E. Keck, Chairman, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

J. W. Bateman	H. F. Ilgner
B. S. Benson, Jr.	F. R. Jeffrey
E. D. Benson	Howard Long
H. E. Carney	John Mucha
D. T. Carter	D. J. O'Neill
A. H. Clarke	M. W. Ross
R. T. Dorsey	D. W. Rowten
R. H. Goodman	R. J. Swackhamer

D. E. Trefry

STANDARDS OF QUALITY AND QUANTITY FOR INTERIOR ILLUMINATION — To prepare standards for illumination levels, brightness limits, brightness ratios for interiors, including specific visual tasks, as well as the general surroundings.

S. K. Guth, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

Glenn A. Fry, Vice-Chairman, School of Optometry, Ohio State University, Columbus, Ohio.

L. E. Barbrow	H. L. Logan
H. R. Blackwell	D. E. Spencer
Ward Harrison	E. M. Strong

STORE LIGHTING — To study the application of light and lighting to the spaces and processes involved in the selling of goods and to report thereon.

R. C. Allison, Chairman, T. Eaton Co., 190 Yonge St., Toronto, Ont.

D. P. Caverly, Vice-Chairman, Sylvania Electric Products, Inc., 1740 Broadway, New York, N. Y.

C. M. Cutler	Richard Kelly
J. R. Jones	A. H. Tackey
J. J. Neidhart	Kenneth Welch
G. G. Rae	F. M. Wolff

STREET AND HIGHWAY LIGHTING — To establish the scientific principles underlying street and highway lighting; to collect data on the results of the application of such principles to actual practice; to prepare such reports thereon as will assist technicians and benefit the public.

C. H. Rex, Chairman, General Electric Co., 920 Western Ave., West Lynn, Mass.

G. K. Glass, Vice-Chairman, Detroit Edison Co., 2000 Second Ave., Detroit, Mich.

D. W. Rowten, Secretary, Westinghouse Electric Corp., 1216 W. 58th St., Cleveland, Ohio.

J. W. A. Bollong	Oscar W. Meissner
R. P. Brotzman	J. F. McGough
R. S. Bucher	Jack H. Murrah
F. M. Carter	J. J. Oberhausen
P. B. Clark	O. P. Ortlieb
T. Dickson	H. W. Osborne
J. L. Eberly	Ellis Paul
W. D. Elmer	F. J. Schmitt
J. H. Fahey	L. J. Schrenk
D. M. Finch	T. J. Seburn
C. A. B. Halvorson	W. A. Shaw
G. K. Hardacre	R. G. Slauer
W. Earle Hawkins	R. M. Swetland
L. F. Heckmann	D. A. Toenjes
R. M. Hoot	G. A. Trosper
H. F. Ilgner	Harold Wall
A. R. Jaeger	G. A. Watters
E. B. Karns	S. R. Williams
G. E. Korten	A. B. Winters
Carl H. Lundell	F. D. Wyatt
Harold Mason	J. W. Young
F. E. Moesta, Jr.	R. M. Zabel

Subcommittee on Visibility under Fog Conditions

Ellis Paul, Chairman, Howard, Needle, Tammen & Bergendoff, 55 Liberty St., New York, N. Y.

E. W. Beggs	George Meese
J. W. A. Bollong	O. W. Meissner
P. B. Clark	C. W. Prisk
A. A. Eastman	E. E. D. Ricker
W. H. Edman	R. M. Swetland
D. M. Finch	R. P. Teele
A. Jaeger	D. A. Toenjes
A. R. Knight	G. A. Trosper
C. H. Lundell	Dana Rowten
Charles Marsh	F. D. Wyatt

R. M. Zabel

Coordination

H. F. Ilgner, Chairman, Bureau of Electrical Service, 713 City Hall, Milwaukee, Wis.

G. A. Trosper	H. W. Osborne

Fluorescent Lighting

R. G. Slauer, Chairman, Sylvania Electric Products Inc., 60 Boston St., Salem, Mass.

W. B. Elmer	O. W. Meissner
R. M. Hoot	L. J. Schrenk

D. A. Toenjes

Interchange with Foreign Groups

W. H. Edman, Chairman, Line Material Co., 800 N. 8th St., Milwaukee, Wis.

R. G. Slauer	D. A. Toenjes

R. M. Zabel

I.E.S. Lighting Handbook

George Korten, Chairman, Consumers Power Co., 212 W. Michigan Ave., Jackson, Mich.

Liaison Subcommittee, International City Managers' Ass'n

G. E. Korten, Chairman, Consumers Power Co., 212 West Michigan Ave., Jackson, Mich.

R. P. Brotzman	J. Murrah
R. M. Hoot	G. A. Trosper
F. E. Moesta	F. D. Wyatt

J. W. Young

Lighting and Traffic Safety

O. P. Ortlieb, Chairman, 311 Municipal Bldg., Trenton, N. J.

F. M. Carter	L. Heckman
J. L. Eberly	H. W. Osborne
J. H. Fahey	F. J. Schmitt
H. E. Wall	R. M. Swetland

Low-Mounting-Height Lighting

R. G. Slauer, Chairman, Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass.

Mercury Vapor Lamps

J. W. Young, Chairman, New England Power Service Co., 441 Stuart St., Boston, Mass.

R. P. Brotzman	R. G. Slauer
P. B. Clark	D. A. Toenjes
R. M. Hoot	G. A. Trosper
H. E. Mason	H. E. Wall
F. E. Moesta	F. D. Wyatt

R. M. Zabel

Parking Area Lighting

J. L. Eberly, Chairman, Hubbard Aluminum Products Co., 6301 Butler St., Pittsburgh, Pa.

W. H. Edman	H. W. Osborne
H. F. Ilgner	Frank Schmidt
E. B. Karns	R. M. Swetland
O. P. Ortlieb	A. B. Winters

J. W. Young

Pavement Surfaces

L. Heckman, Chairman, The Union Metal Mfg. Co., 1432 Maple Ave., N. E., Canton, Ohio.

D. M. Finch	J. O. Kraehenbuehl
C. A. B. Halvorson	L. J. Schrenk
H. F. Ilgner	D. A. Toenjes
L. M. Johnson	H. E. Wall

F. D. Wyatt

Photographic Studies

W. E. Hawkins, Chairman, Atlantic City Electric Co., 1600 Pacific Ave., Atlantic City, N. J.

R. S. Bucher	J. F. McGough
George Eddy	D. A. Toenjes
R. M. Hoot	F. Vaughn

Program and Publicity

J. Murrah, Chairman, Georgia Power Co., 75 Marietta St., Atlanta, Ga.

J. W. A. Bollong	E. B. Karns
L. F. Heckman	O. W. Meissner
G. K. Hardacre	R. M. Swetland

Research

D. A. Toenjes, Chairman, General Electric Co., Nela Park, Cleveland, Ohio.

W. S. Elmer	R. G. Slauer
D. M. Finch	F. D. Wyatt

R. M. Zabel

Traffic Sign Lighting

A. Jaeger, Chairman, Corning Glass Works, Corning, N. Y.

J. L. Eberly	H. W. Osborne
R. M. Hoot	C. W. Prisk

E. D. Ricker

Tunnel and Underpass Lighting

R. M. Swetland, Chairman, General Electric Co., 920 Western Ave., Lynn, Mass.

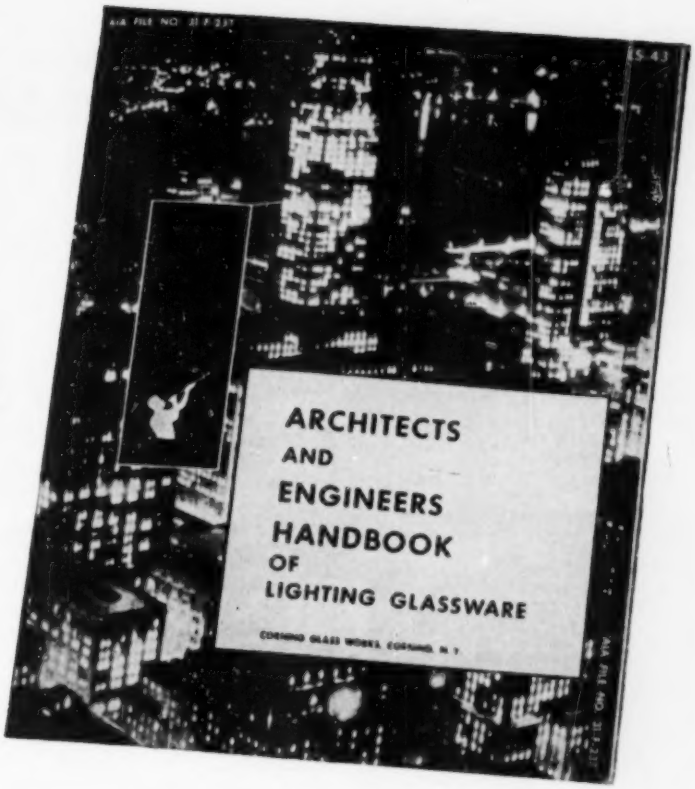
R. M. Hoot	H. W. Osborne
H. E. Mason	F. J. Schmitt
J. J. Oberhausen	G. A. Trosper

D. A. Toenjes

(*Continued on page* 30A)

It saves planning time

It's FREE!



A New Lighting Handbook

for architects and engineers

In planning lighting installations, you must consider many factors to achieve the effects you are seeking . . . accenting decor, improving working efficiency, providing better vision . . . to give your client the best lighting for stores, offices, schoolrooms or factories.

All of this takes time and as a means of helping you make the most of it, Corning lighting engineers have prepared this new handbook. It suggests the most effective uses for various types of lightingware. It contains simple formulas to help make illumination calculations.

There is a section on engineered lighting fundamentals and a discussion of the control of light by refraction, diffusion and reflection. Tables quickly give you room index and point-by-point foot-candle calculation. Note the table of contents, showing other interesting features.

It will take only a moment to write for this handbook and it will save lots of time whenever you are planning a lighting job. Write for it today.

Table of Contents:

Lighting Glassware Basic Types
Lighting with Large Area Luminous Elements
Lighting with Fluorescent Troffers
Lighting with Surface-Mounted and Suspended Luminaires
Product Information Table, Fluorescent Lighting Glassware
Lighting with Incandescent Lensed Fixtures
Product Information Table, Incandescent Lighting Glassware
Calculation Section

CORNING GLASS WORKS
Corning, N. Y.

PYREX

Corning means research in Glass

CORNING GLASS WORKS, Dept. IE-12, Corning, N. Y.
As my work includes the design and specification of engineered lightingware, please send copy of the "Architects and Engineers Handbook of Lighting Glassware."

Name.....Title.....
Company.....
Address.....
City.....Zone.....State.....

TECHNICAL COMMITTEE FORUM — To coordinate procedures of our technical committees and to sponsor a lighting application symposium at the National Technical Conference.

D. M. Jones, Chairman, Curtis Lighting of Canada, Ltd., 991 St. Antoine St., Montreal, Que.

R. F. Hartenstein, Vice-Chairman, Ohio Edison Co., 47 N. Main St., Akron, Ohio.

W. C. Brown — B. G. Tremaine, Jr.
W. P. Lowell, Jr. — A. F. Wakefield
I. A. Yost

TELEVISION COMMITTEE ON LIGHTING FOR PRODUCTION — To study and report on the lighting for production of television programs.

R. L. Zahour, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

H. A. Anderson — H. A. Kliegl
F. E. Carlson — Walter O'Meara
Rodney Davis — K. Palius
G. J. DeStephano — J. Paulaskas
D. W. Frick — K. Reichenbach
George Gill — Lee Watson
A. Jacobovitz — W. R. Wilson

Subcommittee on Lighting Practices

(Camera characteristics, video control, lighting and instrumentation.)

Rodney Davis, Chairman, National Broadcasting Co., 30 Rockefeller Plaza, New York, N. Y.

Carl Gaiti — J. Paulaskas
Lee Watson

Subcommittee on Light Sources Required for Color Television

W. R. Wilson, Chairman, Westinghouse Electric Corp., Bloomfield, N. J.

H. A. Anderson — L. E. Innis
F. E. Carlson — Walter O'Meara

Subcommittee on Lighting Equipment for Color Television

George Gill, Chairman, Kliegl Brothers, 321 W. 50th St., New York, N. Y.

G. J. DeStephano — A. Jacobovitz
Carl Gaiti — Walter O'Meara
K. Palius

TESTING PROCEDURES FOR ILLUMINATION CHARACTERISTICS — To prepare standard test procedures for illumination characteristics of light sources, lighting equipment and illumination materials, and to report thereon.

Kurt Franck, Chairman, Holophane Co., Inc., Newark, Ohio.

E. W. Beggs — W. F. Little
J. E. Bock — John Losh
R. D. Bradley — James McCulloch
P. B. Clark — Phelps Meaker
D. M. Finch — F. M. Neal
J. S. Franklin — W. F. Nottleman
S. M. Gray — Priscilla Presbrey
W. G. Hill — D. W. Rowten
G. A. Horton — R. P. Teele
A. W. Krawcek — A. W. Weeks
A. P. Larson — E. H. Witte

OFFICIAL REPRESENTATIVES TO OTHER ORGANIZATIONS

AMERICAN STANDARDS ASSOCIATION SECTIONAL COMMITTEES

(C. L. Crouch, Technical Director, ex-officio member of all.)

Building Exits Code, A9
B. F. Greene

American Standard Practice for Industrial Lighting, A11
W. C. Brown
E. A. Linaday, Alternate

American Standard Practice for School Lighting, A23
John Choriton

Building Code Requirements for Light and Ventilation, A53
B. F. Greene

National Electrical Code, C1
G. E. Shoemaker, Panel 2, 3 and 10

Definitions of Electrical Terms, C42
Harris Reinhardt

Dimensional and Operational Standardization of Electric Lamps and Auxiliaries for Gaseous Discharge Lamps, C78
Thomas S. Kelly

Inspection Requirements for Motor Vehicles, D7
R. N. Falge

Standard for Motion Pictures, PH22; Sectional Committee PH2, Photographic Sensitometry
R. E. Farnham

Office Standards, X2
Subcommittee 1—Office Equipment (furniture)
Subcommittee 2—Office Papers
Subcommittee 5—Business Machines
R. L. Oetting
George J. Taylor, Alternate

Letter Symbols and Abbreviations for Science and Engineering, Y10
Harris Reinhardt

Drawing and Drafting Room Practice, Y14
Harris Reinhardt

Graphical Symbols and Abbreviations for Use on Drawings, Y32
Harris Reinhardt

Preferred Numbers, Z17
J. R. Jones

Standardization in the Field of Photography, Z38
R. E. Farnham

Safety Color Code, Z53
W. H. Kahler

Colors for Industrial Apparatus Equipment, Z55
C. E. Egeler

Standardization of Optics, Z58
Harris Reinhardt

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, GOVERNING BOARD
S. K. Guth

ARMED SERVICES N.R.C. VISION COMMITTEE
C. L. Crouch

INDUSTRY COMMITTEE IN CONNECTION WITH THE REVISION OF "HANDBOOK OF INTERIOR WIRING DESIGN"
A. C. Bredahl
G. E. Shoemaker

Publication of New Handbook on Wiring for Small Commercial Occupancies
David P. Wood

Revision of Present Farm Handbook
P. H. Hildebrand

INSTITUTE OF TRAFFIC ENGINEERS, JOINT COMMITTEE ON HIGHWAY LIGHTING
H. F. Ilgner

INTER-SOCIETY COLOR COUNCIL
Norman Macbeth, Chairman
L. H. Brown — H. L. Logan
E. W. Commery — J. A. Meacham
Dean Farnsworth — R. C. Allison
W. F. Little — C. L. Cottrell

LIGHT'S DIAMOND JUBILEE
S. G. Hibben

NATIONAL COMMITTEE ON TRAFFIC SAFETY
C. H. Rex
F. D. Wyatt, Alternate

NATIONAL COMMITTEE ON UNIFORM TRAFFIC LAWS AND ORDINANCES
R. N. Falge

Subcommittee on Vehicle Lighting
Ray P. Teele
Val J. Roper, Alternate

NATIONAL OFFICE MANAGEMENT ASSOCIATION
R. L. Oetting

NATIONAL RESEARCH COUNCIL

Division of Engineering and Industrial Research
H. L. Logan

National Academy of Sciences
A. F. Wakefield

Highway Research Board
Howard F. Ilgner

PRESIDENT'S HIGHWAY SAFETY CONFERENCE

Engineering Committee
C. H. Rex
F. D. Wyatt, Alternate

Committee on Organized Public Support
A. H. Manwaring

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS
H. A. Kliegl

U. S. NATIONAL COMMITTEE OF THE INTERNATIONAL COMMISSION ON ILLUMINATION

L. E. Barbrow — S. G. Hibben
A. A. Brainerd — A. H. Manwaring
W. C. Brown — G. H. Stickney
C. L. Crouch — E. M. Strong
M. N. Waterman

U. S. NATIONAL COMMITTEE OF THE INTERNATIONAL ELECTRO TECHNICAL COMMISSION
Walter C. Wagner

New Members

(*Continued from page* 21A)

NORTHERN CALIFORNIA SECTION

Associate Member:

Bartels, Frank, Boyd Lighting Fixture Co., San Francisco, Calif.

OHIO VALLEY SECTION

Associate Member:

Wilson, E. J., Curtis Lighting Inc., Cincinnati, Ohio.

OKLAHOMA CHAPTER

Member:

Postlewait, E. C., Public Service Co. of Oklahoma, Bartlesville, Okla.

OREGON SECTION

Associate Members:

Hines, B. W., North Coast Electric Co., Portland, Ore.

James, M. B., Northwestern Agencies, Portland, Ore.

Schoeni, Mrs. Grace C., Portland General Electric Co., Portland, Ore.

OTTAWA CHAPTER

Associate Member:

Purvis, W. J., National Research Council, Ottawa, Canada.

PITTSBURGH SECTION

Associate Member:

Sternberg, L. S., Pittsburgh Reflector Co., Pittsburgh, Pa.

PUGET SOUND SECTION

Associate Members:

Nelson, C. R., Pryne & Co., Seattle, Wash.

Shaw, R. E., B. T. Heinz Co., Seattle, Wash.

ROCHESTER SECTION

Associate Member:

Kline, W. B., Burke Steel Co. Inc., Rochester, N. Y.

(*Continued on page* 32A)

SERIES XVIII LIGHTING DATA SHEETS

Whether for your personal use or for distribution to customers and prospects, there is no handier working tool for lighting people than the I.E.S. Lighting Data Sheets. Each yearly series of 24 sheets bring a new selection of top-notch solutions to serious lighting problems. Series XVIII, first 16 sheets of which are now available, is no exception.

Concise, well-illustrated, highly informative... you'll find a binder of I.E.S. Lighting Data Sheets a deep well of lighting ideas for every type of installation.

Start your idea binder now . . . with Series XVIII I.E.S Lighting Data Sheets. Become a regular subscriber.

Series XVIII IES Lighting Data Sheets . . . 24 to series, first 16 sheets available now . . . remaining 8 to be mailed in January, 1954 . . . $1.25 per series; $1 in lots of 10 or more sets.

. . . . . ORDER NOW! . . . . .

Publications Office
Illuminating Engineering Society
1860 Broadway, New York 23, N. Y.

Enter my subscription to Series XVIII IES Lighting Data sheets

Name .....

Street .....

City ..... **Zone** ..... **State** .....

☐ **Check (M. O.) enclosed** ☐ **Bill me**

COMPLETE LINE OF
QUALITY FLUORESCENT
AND
SLIMLINE FIXTURES
FOR EVERY REQUIREMENT...
COMMERCIAL & INDUSTRIAL
BY
WILEY
Pioneers in Fluorescence
Since its Inception

- **Modern, functional designs to harmonize with any architectural motif.**
- **Stock fixtures adaptable for all lighting layouts.**
- **Units designed for quick, easy erection. A minimum of "on-the-job" assembly.**
- **Patented E-Z Servicer.**
- **District Sales Engineers available for prompt cooperation.**

Designed and completely manufactured by WILEY, with ETL Certified Electrical Components

For Full Information, write
R&W WILEY, INC.
Dearborn at Bridge St.
Buffalo 7, N. Y.
Underwriters' Approved
IBEW - A.F. of L. Label
Fleur-O-Lier Certified Models

When considering lighting, you certainly want the most effective illumination at the most reasonable cost. You also expect your lighting equipment to be thoroughly engineered, photometrically designed and of quality construction. You probably have found from experience that Sunbeam lighting equipment turns out to be the better value.

Four "First Awards" in 1953 for lighting installations specifying Sunbeam luminaires should prove that you are right.

Shown here is a modular installation of Sunbeam's highly efficient #L1784 units in Walker's department store at Long Beach, California. Value-wise shoppers may not know that maximum utilization from existing wiring was achieved in this installation but you may be assured that these versatile, shallow fixtures (which may be mounted in various geometric patterns) are a real value.

SUNBEAM LIGHTING COMPANY
777 East 14th Pl., Los Angeles 21, California

(Continued from page 30A)

SAN DIEGO CHAPTER

Member:

*Lipscomb, W. L., 319-320 Spreckles Bldg., San Diego, Calif.

SAN JACINTO SECTION

Associate Member:

Flynn, V. P., Graybar Electric Co. Inc., Houston, Texas.

SOUTHEAST FLORIDA CHAPTER

Student Member:

Templeton, G. W., University of Miami, Miami, Fla.

SOUTHERN CALIFORNIA SECTION

Associate Members:

Blotto, E. L. City of Los Angeles, Los Angeles, Calif.

Cabrera, E. M., The Electrical Estimators, Los Angeles, Calif.

Flower, Emanuel, Lee Mantenance Co. Ltd., Los Angeles, Calif.

Merritt, L. Y., 5135 Lennox Blvd., Inglewood, Calif.

O'Neil, K. A., Associated Wholesale Electric Co., Los Angeles, Calif.

Prince, R. R., Torito Road, Santa Barbara, Calif.

Spivak, H. R., Flood Lite Service Inc., Los Angeles, Calif.

SOUTHWESTERN SECTION

Associate Members:

Collings, B. J., Texas Electric Service Co., Eastland, Texas.

Harrison, T. R., Harrison Milner Co., Dallas, Texas.

McCord, M. M., Electrical Wholesalers, Dallas, Texas.

Watson, B. E., Peabody Brothers, Dallas, Texas.

TENNESSEE VALLEY SECTION

Associate Members:

Bourgeois, H. W., General Electric Co., Nashville, Tenn.

Brooks, W. F., Braid Electric Co., Nashville, Tenn.

Edwards, G. D., Jr., Edwards Electric Co., Nashville, Tenn.

McCord, J. T., 315 5th Ave. N., Nashville, Tenn.

TORONTO SECTION

Members:

*Knudson, K. V., Crouse Hinds Co. of Canada, Ltd., Toronto, Ont.

*Machtinger, E., Crouse Hinds Co. of Canada, Ltd., Toronto, Ont.

Associate Members:

Aylward, B. C., W. H. Bonus, Consulting Engineer, Toronto, Ont.

Campbell, G. L., Canadian General Electric Co. Ltd., Toronto, Ont.

Frank, R. W., Canadian General Electric Co., Ltd., Toronto, Ont.

Haley, R. E., anadian General Electric Co., Ltd., Toronto, Ont.

Jacques, R. G., Canadian General Electric Co., Ltd., Toronto, Ont.

Nordby, L. R., Canadian General Electric Co., Ltd., Toronto, Ont.

Ormrod, K. R., Canadian General Electric Co. Ltd., Toronto, Ont.

Sims, E. A., Canadian General Electric Co. Ltd., Toronto, Ont.

Wetleseu, J., Canadian General Electric Co. Ltd., Toronto, Ont.

Whitehead, A., Canadian General Electric Co. Ltd., Toronto, Ont.

TWIN CITY SECTION

Associate Members:

Bruce, M. H., Bettenburg, Townsend & Stolte, St. Paul, Minn.

Cherner, M. E., Lightolier Inc., Hopkins, Minn.

Cohen, A. D., Lax Electric Co., St. Paul, Minn.

Fischer, H. C., Line Material Co., Minneapolis, Minn.

Krause, M. O., City of St. Paul, St. Paul, Minn.

Mealey, R. V., General Electric Supply Co., St. Paul, Minn.

Moir, R. E., Northern States Power Co., Eau Claire, Wis.

Palus, R. J., Northern States Power Co., Red Wing, Minn.

Pleason, M., M. Pleason Associates, Inc., St. Paul, Minn.

Sandvold, N. C., Luxor Lighting Products Inc., New York, N. Y.

Smith, W. D., General Electric Co., Minneapolis, Minn.

Werket, J. R., Northern States Power Co., St. Paul, Minn.

UTAH CHAPTER

Member:

Davis, A. R., Ariel Davis Mfg. Co., Salt Lake City, Utah.

Associate Members:

Darger, R. W., The Darger Co., Salt Lake City, Utah.

Sherwood, H. S., Utah Power & Light Co., Salt Lake City, Utah.

WINNIPEG CHAPTER

Associate Member:

Searle, Lewis, American Electrical Supply Co., Ltd., Winnipeg, Man.

WHAT'S NEW? IN COLD CATHODE LIGHTING

Acme-Electric CONSTANT LIGHT-OUTPUT BALLASTS

No light loss by voltage variation — no light loss by aging lamps. That's the advantages of using an Acme Electric type CX-2812-11 ballast with 2-25 mm 93" cold cathode lamps. Input voltage variation as great as ± 10% has no effect upon light output. And, as aging normally reduces the light output efficiency this ballast automatically accommodates for this lamp aging loss by providing a compensating watt increase to maintain high light output.

Write for bulletin CCB-193 for complete details.

Acme-Electric TRANSFORMERS

ACME ELECTRIC CORPORATION
MAIN PLANT: 2912 WATER STREET • CUBA, N. Y.
West Coast Engineering Laboratories:
1375 West Jefferson Boulevard. • Los Angeles, California
In Canada: Acme Electric Corp. Ltd.
50 North Line Road • Toronto, Ontario

DUST-FREE LOUVERS with MERIX ANTI-STATIC #79

★ Keeps Plastics Dust-Free; Lint-Free.

★ Used on all "Smooth-Surface Plastics" like Polystyrenes, Styrenes, Vinylites; Injection molded Plastics

★ Wiped, Dipped or Sprayed On

★ Application on One Side Removes Dust-Attracting Static on Both Sides (Up to ⅛" thickness), of Luminaire Panels.

NEWEST ON #79 FOR DIPPING: ½ #79 to ½ WATER lowers quantity or cost to $1.50 gal. gives ABSOLUTELY SPOT FREE HIGH-LUSTRE FINISH.

AVAIL YOURSELF OF:

☐ Free Reprint of Test-report of De-Staticizers published in ILLUMINATING ENGINEERING.
☐ Our detailed literature;
☐ Sample Quart:— $3.85
☐ Sample Gallon:— $8.50

FOB CHICAGO, ILL.

Write or wire TODAY!

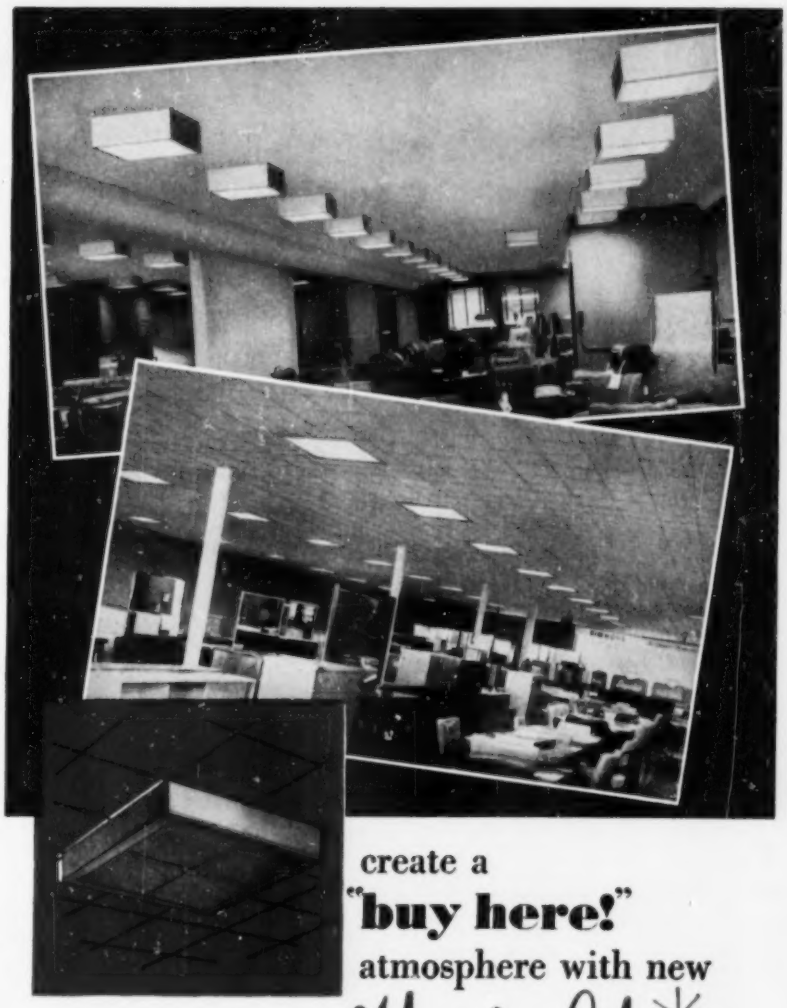
MERIX CHEMICAL COMPANY
DEPT. I.E.S. 123
1021 E. 55th St., Chicago 15, Ill.

INDEX TO ADVERTISERS
December 1953

Acme Electric Corp.	32A
Advance Transformer Co.	17A
Benjamin Electric Mfg. Co.	Back Cover
Corning Glass Works	29A
Day-Brite Lighting Inc.	24A
General Electric Co., Lamp	Inside Back Cover
Edwin F. Guth Co.	33A
Kopp Glass Inc.	23A
Litecontrol Corp.	18A
Merix Chemical Co.	32A
Mitchell Manufacturing Co.	34A
Rohm & Haas Co.	15A
Sola Electric Co.	26A
Starring & Company Inc.	2A
Sunbeam Lighting Co.	31A
Superior Electric Co.	11A
Sylvania Electric Products Inc.	12A
F. W. Wakefield Brass Co.	Inside Front Cover
Westinghouse Electric Corp., Lighting	1A
R. & W. Wiley Inc.	31A

LIGHTING APPLICATION ENGINEER

Opportunity for man with experience in lighting layouts utilizing incandescent and arc sources. Knowledge of basic fixture design and construction together with application methods also desirable. Permanent job with opportunity for advancement in a long-established, and expanding organization located in New York City. Write full details giving age, past experience, and availability. Confidential. Address Box 198, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y.



create a
"buy here!"
atmosphere with new

Guth Magic-lite* with **GRATELITE**** Louver-Diffuser

the magic combination of architectural beauty and sales-building lighting for contemporary store interiors.

GUTH MAGIC-LITE is well-shielded by a GRATELITE Louver-Diffuser. It transforms the direct light into softly flattering illumination, essential for good merchandising.

LOW ORIGINAL COST—LOW UPKEEP COST

Uses least expensive lamps—GrateLite Louvers are cleaned in 2 minutes.

VERSATILE

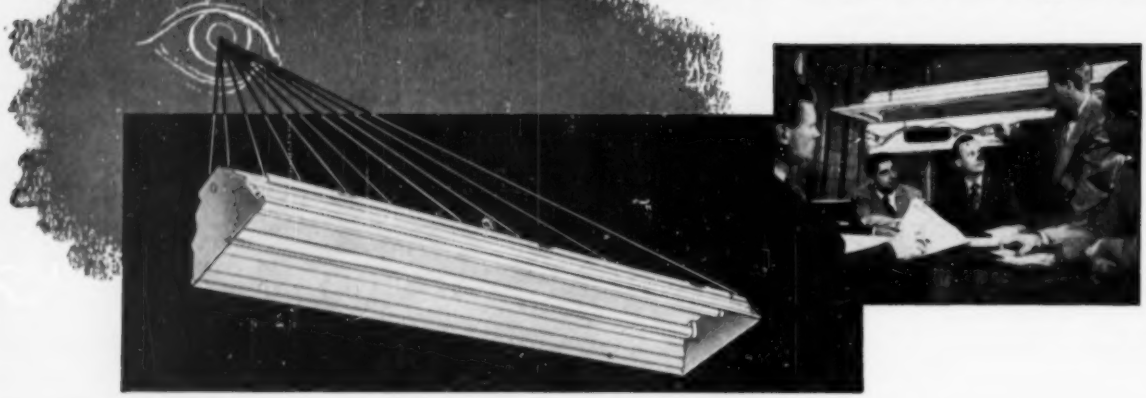
Mount singly or in patterns. Recess or surface. 24" or 12" square sizes.

May we send you our new Magic-lite Catalog 901-I ?

*Trademark
**U.S. & Can. Pats. Pend. Trademark Registered

THE EDWIN F. GUTH CO. ST. LOUIS 3, MO.
Leaders in Lighting since 1902

open your eyes to this revelation in recessed lighting

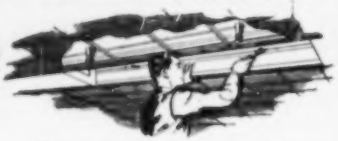


MITCHELL *uni-flow* fluorescent troffers

NOW you can specify recessed lighting that's years ahead of anything in the field. It's MITCHELL UNI-FLOW . . . completely new . . . dramatically different . . . easier to specify, easier to install, far superior in lighting efficiency. Architects, contractors, utility men and wholesalers say unanimously: *"This is what we've wanted in recessed lighting!"*

JUST 4 EASY STEPS TO A PERFECT *uni-flow* ONE MAN INSTALLATION

1 Uni-Hangers are roughly located in ceiling opening (no critical measuring required). Takes just minutes, regardless of ceiling construction. Saves hours of time on any job—cuts installation costs sharply.



2 Troffer shell (less ballasts, lampholders or reflectors) clamps to Uni-Hangers by means of special Uni-Liner clips (an easy one-man job). Simple screwdriver adjustment levels troffer properly.

3 Reflector-ballast-lampholder plate (the bulk of the total troffer weight) is attached to troffer shell by means of jack chains. Thus, there is no weight on the installer's hands when wiring.

4 With wiring completed, reflector-ballast-lampholder assembly attaches to troffer shell by means of exclusive "Perma-Latch" (no tools or extra loose parts required). Job is now ready for easy lamping.

HERE'S EVERYTHING YOU NEED FOR SIMPLIFIED RECESSED LIGHTING

Here is a complete family of matching troffers in every useful length. Units are available in 2-foot, 4-foot, 5-foot, 6-foot, 8-foot or 10-foot lengths, in deep (10") or shallow (7") types.

Here is the widest selection of shielding equipment: choice of Metal Louver, Plastic Louver, Alba-Lite, Prismatic Glass, Unilens, Twinlens, Curved Lens, Fota-lite, Longitudinal Shields and Crosswise Baffles.

UNI-FLOW troffers offer a choice of 40-watt T-12 standard or instant-start bi-pin lamps, 38-watt Slimline, 54-watt Slimline, 75-watt Slimline, 40-watt T-17 low brightness, 85-watt Krypton, 20-watt T-12 lamps.

Troffers are available with 1, 2 or 3 lamps (except 5-ft. and 10-ft. units with 1 or 2 lamps only). One-lamp units are available in choice of Alzak or baked white enamel reflector; two and three lamp units with baked white enamel reflector.

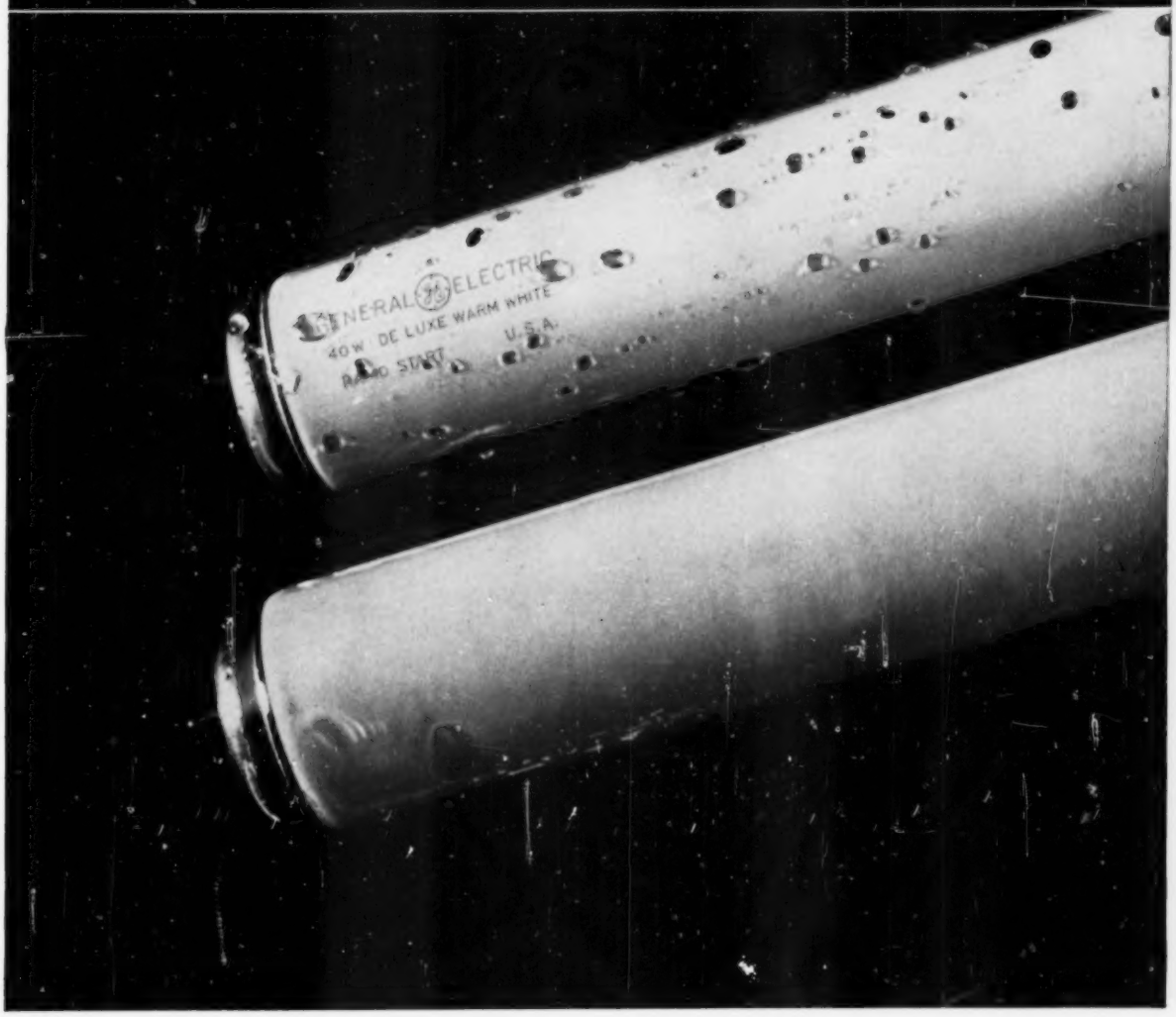
Only MITCHELL UNI-FLOW has these time-saving, cost-cutting features

Write, phone or wire today for the complete facts about MITCHELL UNI-FLOW

Address Dept. 3-M.

MITCHELL MANUFACTURING COMPANY
2525 N. Clybourn Ave., Chicago 14, Ill.
In Canada: Mitchell Mfg. Co., Ltd., 14 Waterman Ave., Toronto

You expect the best value from G-E fluorescent lamps



Silicone coat on new G-E Rapid Start lamps helps them start quicker

Moisture in the air can make a fluorescent lamp slow to start. The wet film that condenses on the lamp is a good enough conductor to detour some of the electricity needed for proper starting.

General Electric has tailored a "raincoat" that stops this. It's made of silicone and breaks up the wet film into tiny droplets, leaving dry areas that interrupt the electrical contact. Less current is stolen. Starting is quicker, surer.

We call the coating Dri-Film*. The photo above shows the difference it makes. Moisture breaks up into droplets on the Dri-Film* lamp, forms a smooth coating on the ordinary lamp.

You get Dri-Film* on G-E Rapid Start lamps. It's invisible, won't rub off, helps assure you all the light you pay for. Many leading manufacturers have designed lighting fixtures to use Rapid Start lamps and their special Rapid Start ballasts. You *expect* the best value from G-E fluorescent lamps. Here's another reason you can.

For more information, write General Electric, Department 166-IE-12, Nela Park, Cleveland 12, Ohio.

*Reg. U. S. Pat. Off.

You can put your confidence in—

GENERAL ELECTRIC

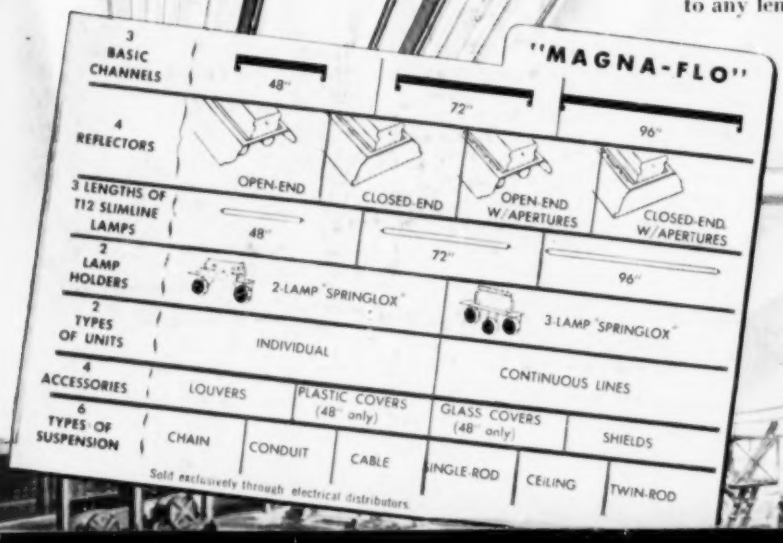
BENJAMIN

Versatile "Magna-Flo" SYSTEMS

go to any length to fit your lighting requirements!

Yes, ONE fluorescent lighting system for all three lengths of T12 Slimline Lamps! It's Benjamin "Magna-Flo" . . . so easily adapted to any size area, any type of location found in industry. No matter where you want fluorescent light . . . high ceilings or low ceilings, assembly lines or drafting rooms, lighting for inspection or mass production . . . whatever the seeing conditions and requirements of the task, there's a "Magna-Flo" System to fill the need exactly. As shown by the chart below "Magna-Flo" is really complete . . . yet so simple to order and specify, because just three channel sizes and four basic reflectors form the backbone of over 300 different fluorescent lighting systems!

Write for Bulletin AD 5705 for complete specification data on Benjamin "Magna-Flo" . . . see how it goes to any length to suit your fluorescent lighting needs!



A Product of Benjamin Electric Mfg. Co., Dept. I
Des Plaines, Ill., makers of famous Benjamin and Leader Line Lighting Equipment and Sound Signals for Industry, Institutions and Commerce.

BENJAMIN "Springlox"—the exclusive "easy-in easy-out" lampholder which reduces maintenance costs and re-lamping time with a patented spring design . . . "Springlox" is standard equipment with all "Magna-Flo" units.

B-297